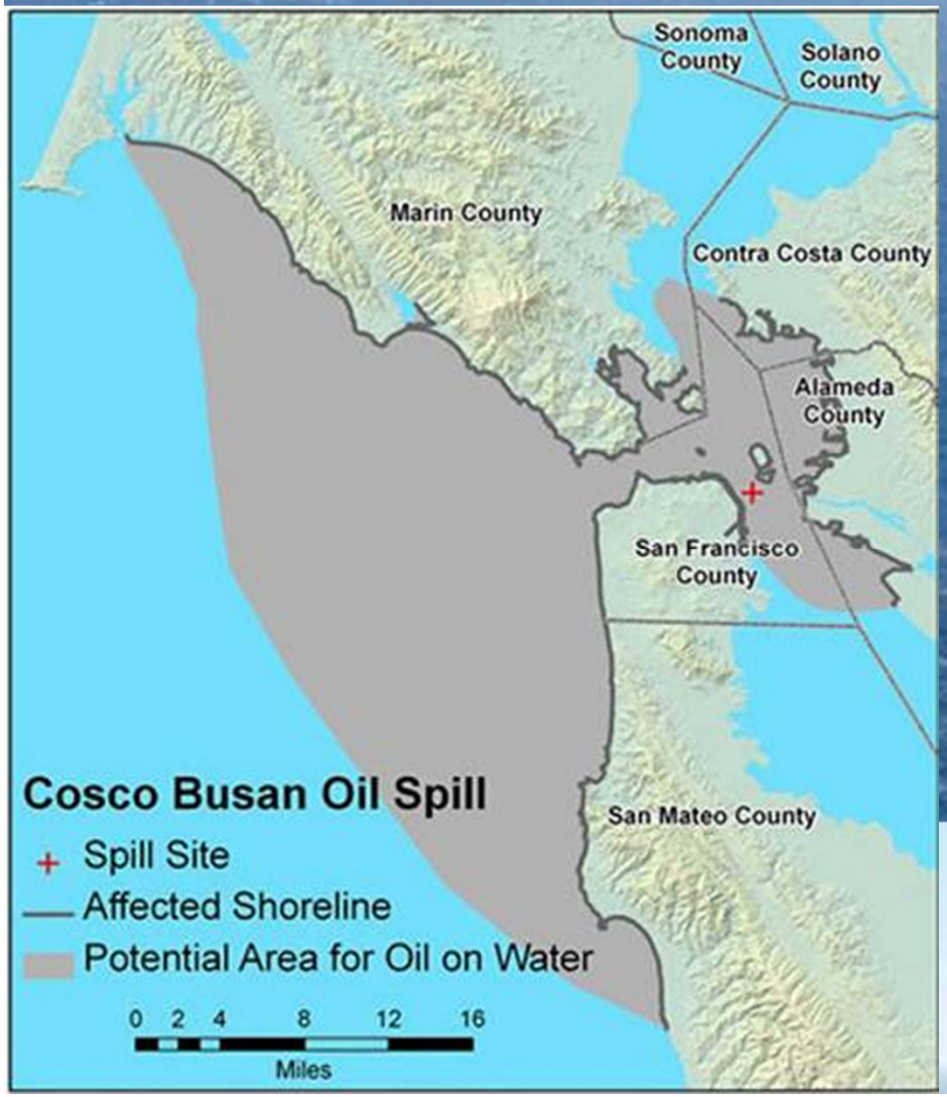
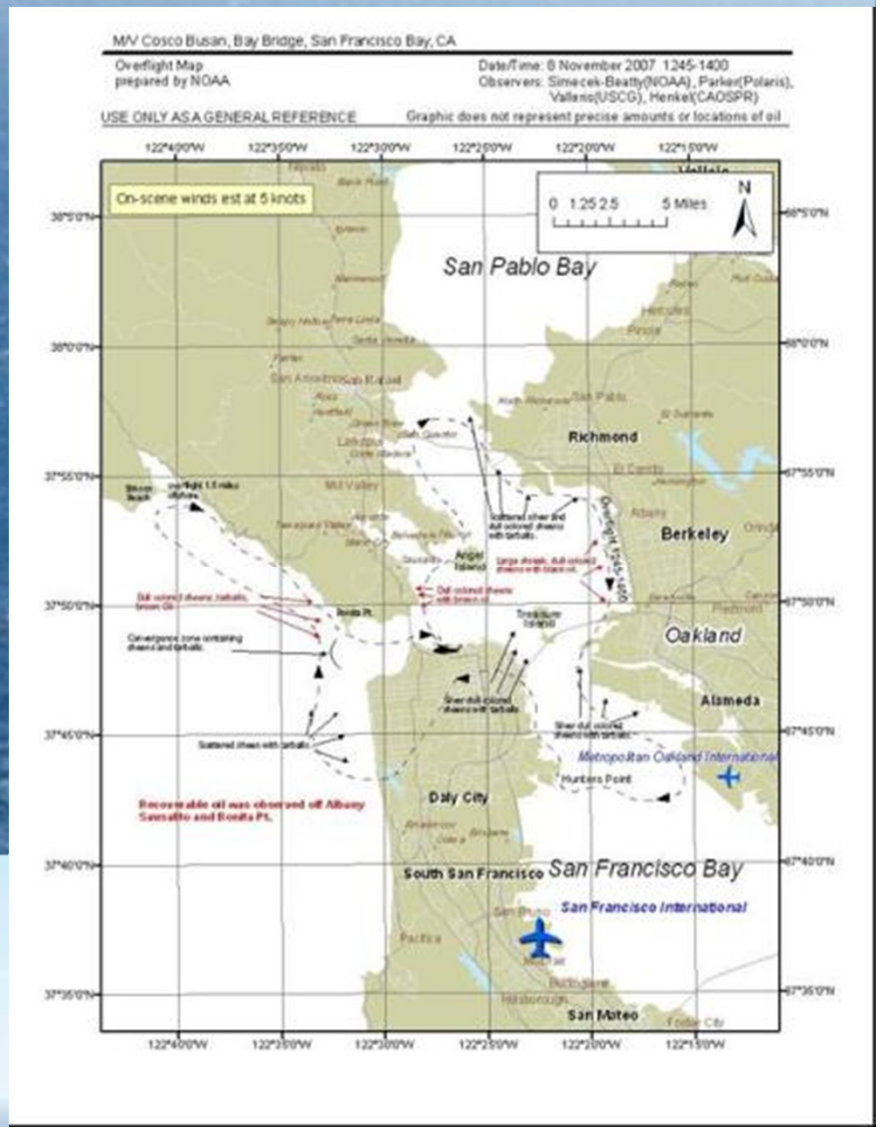
Case Study 1: Oil Spills

- Cosco Busan hit Oakland Bay Bridge Nov. 7, 2007
  - 2004-present Establishment of California HF Radar array
  - 2005 IOOS office supports CORDC to develop HFR national network distribution
  - 2006 SafeSeas06 was the first collaborative effort between OOS and NOAA OR&R netCDF format standardized,
  - 2007 *CoscoBusan* incident used HFR in spill predictions, development of GIS format
  - 2008 HF Radar integration into both Office of Spill Prevention and Response (OSPR) and Office of Response and Restoration for GNOME forecasting model and used in National Preparedness for Emergency Response Planning (NPREP)
- Deepwater Horizon well blowout Apr. 20, 2010
  - April 20, 2010 No Gulf of Mexico HF Radar systems online
  - April 24, 2010 University of Southern Florida Systems online in national network
  - May 01, 2010 University of Southern Mississippi systems online in national network

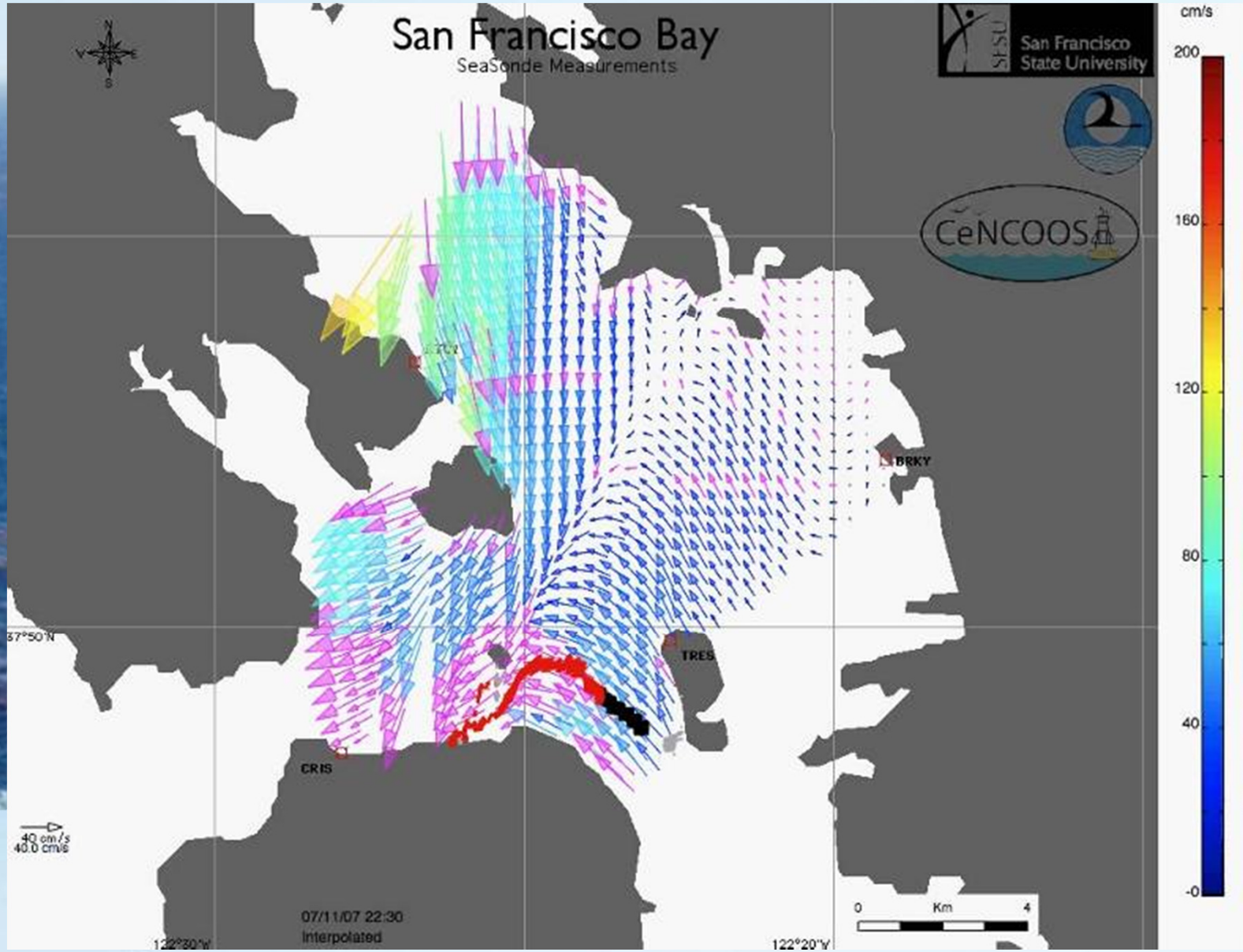
CeNCOOS and Cosco Busan Spill

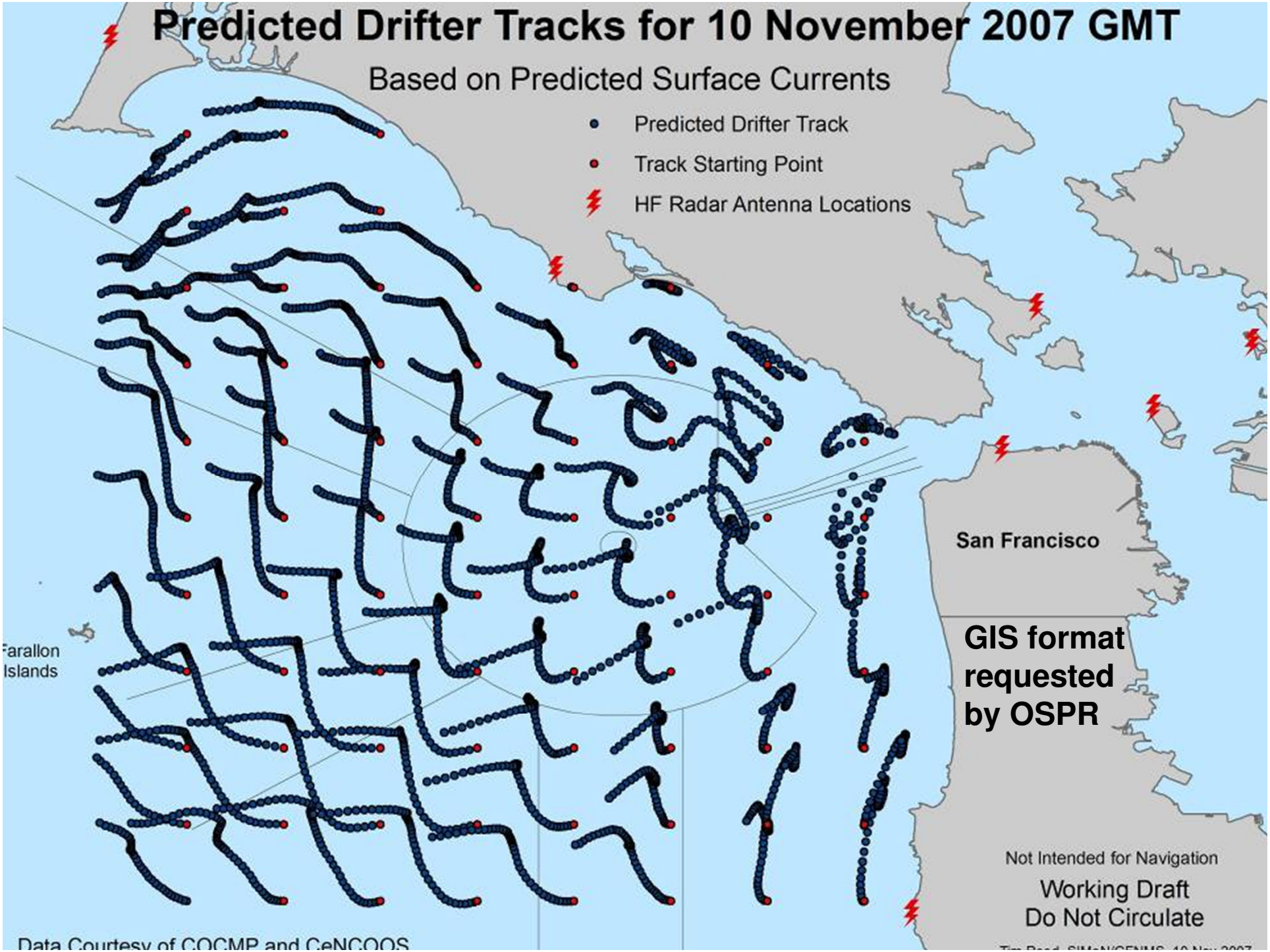
http://www.cencoos.org/sections/news/SF_oil_spill_2007.shtml



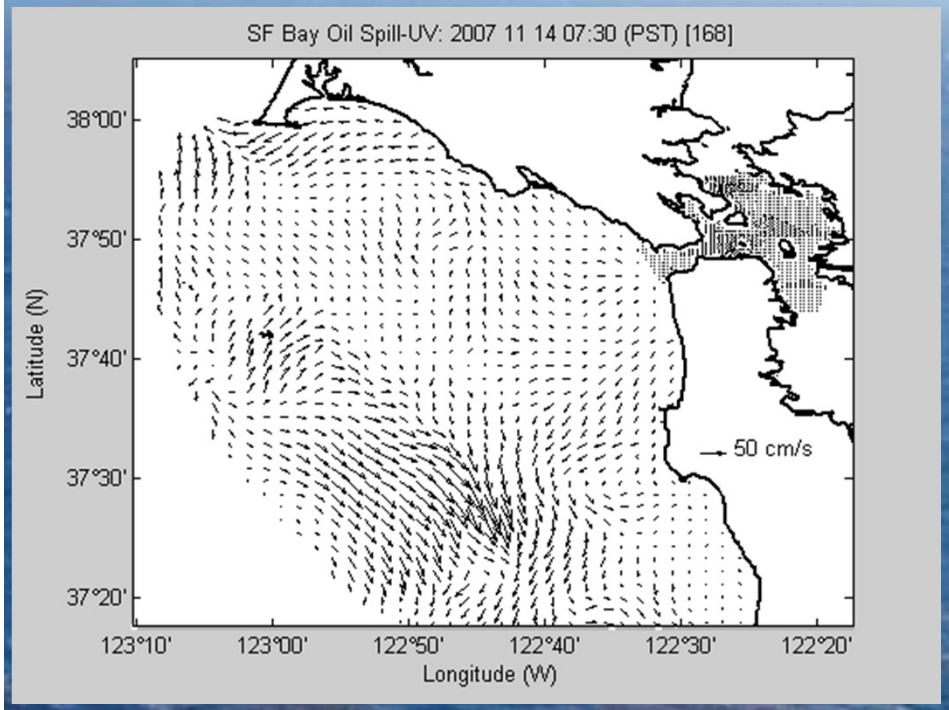


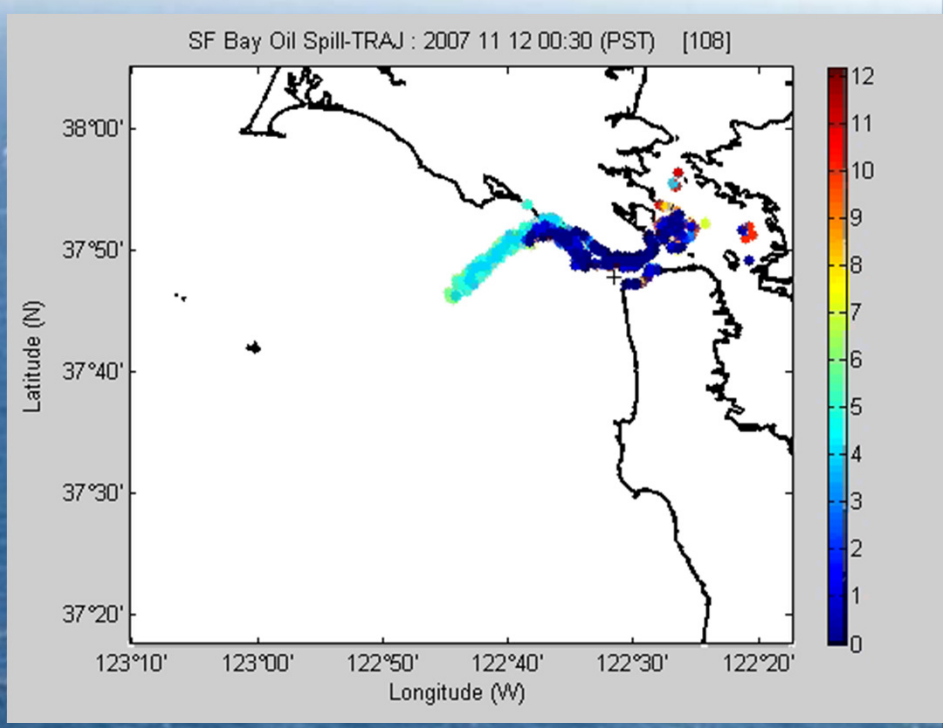
http://norcalcurrents.org/COCMP/oil_spill.html




Predicted Drifter Tracks for 10 November 2007 GMT
Based on Predicted Surface Currents
Predicted Drifter Track
Track Starting Point
HF Radar Antenna Locations
San Francisco
GIS format requested by OSPR
Not Intended for Navigation
Working Draft
Do Not Circulate
Data Courtesy of COCMP and CeNCOOS

Oil Spills – Cosco Busan, San Francisco Bay
Gap filled data, Trajectories

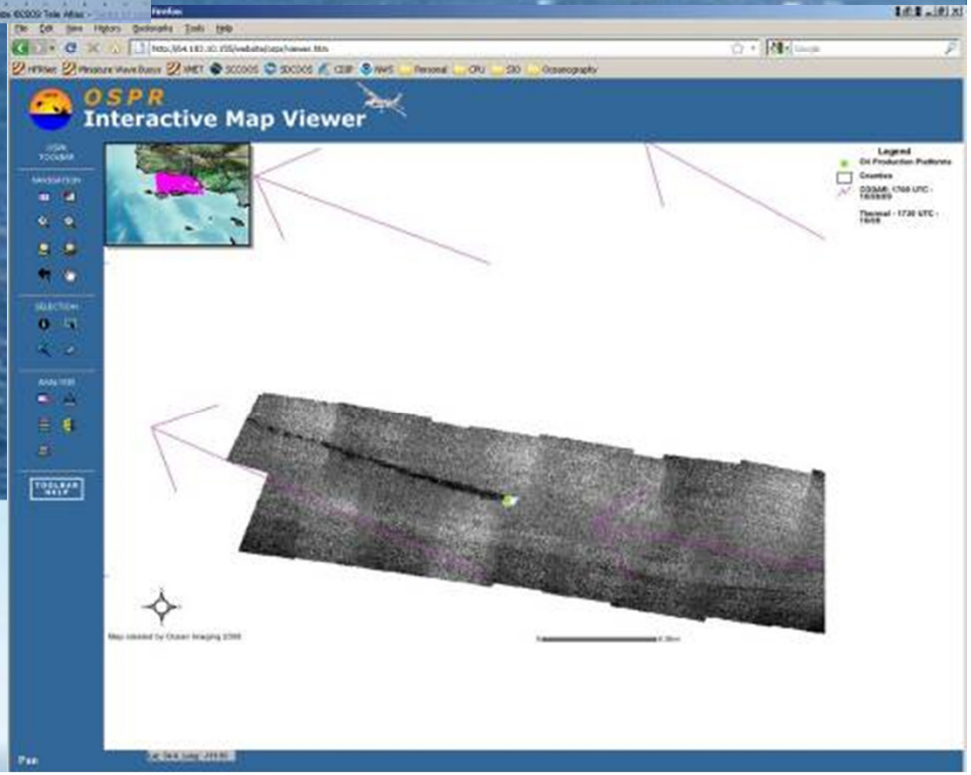




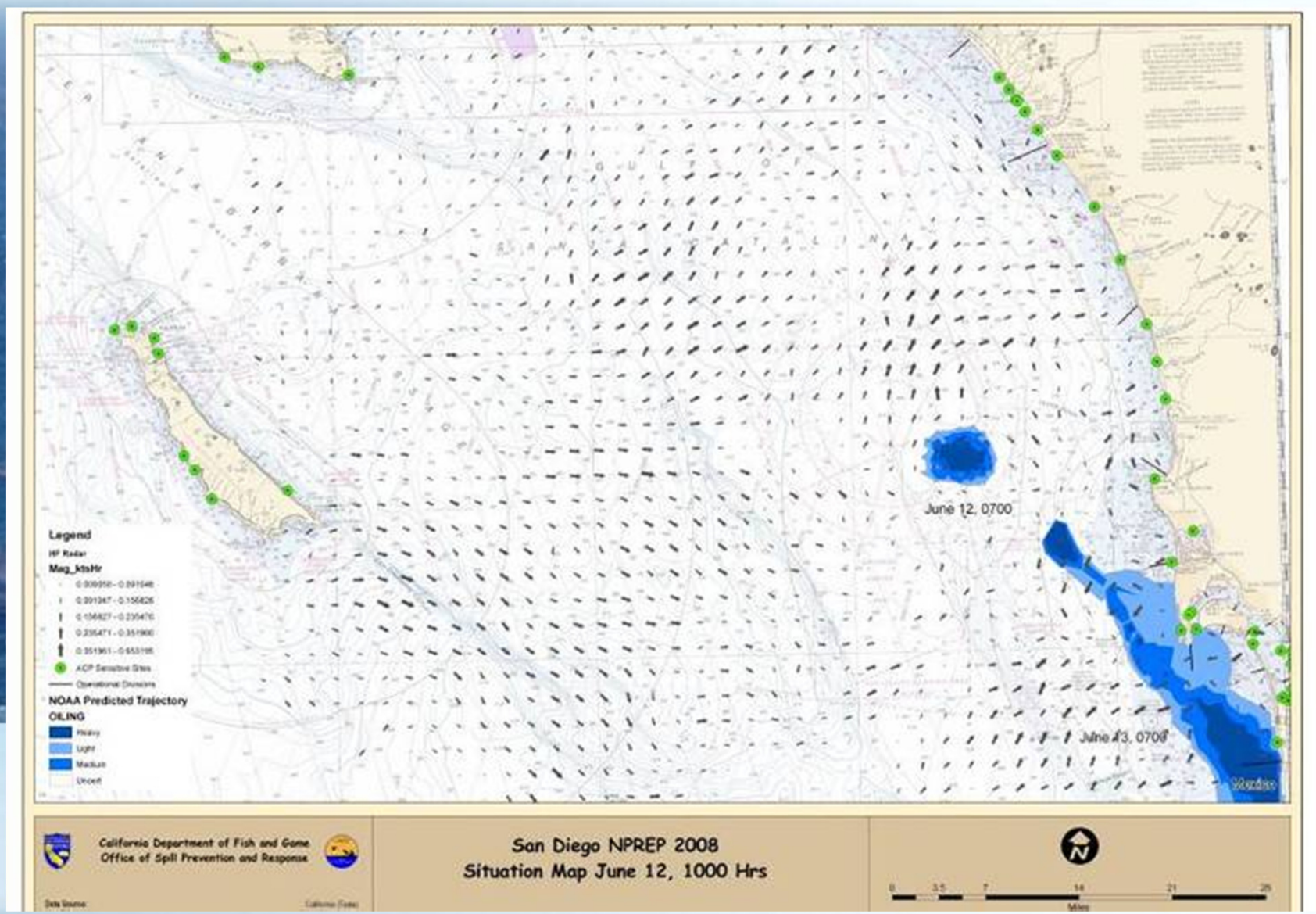
Oil spilled or flowing into offshore waters is within an environment where HF radar observations can be uniquely helpful in tracking and predicting movements

Improved network response and data integration between Cosco Busan and Deepwater Horizon

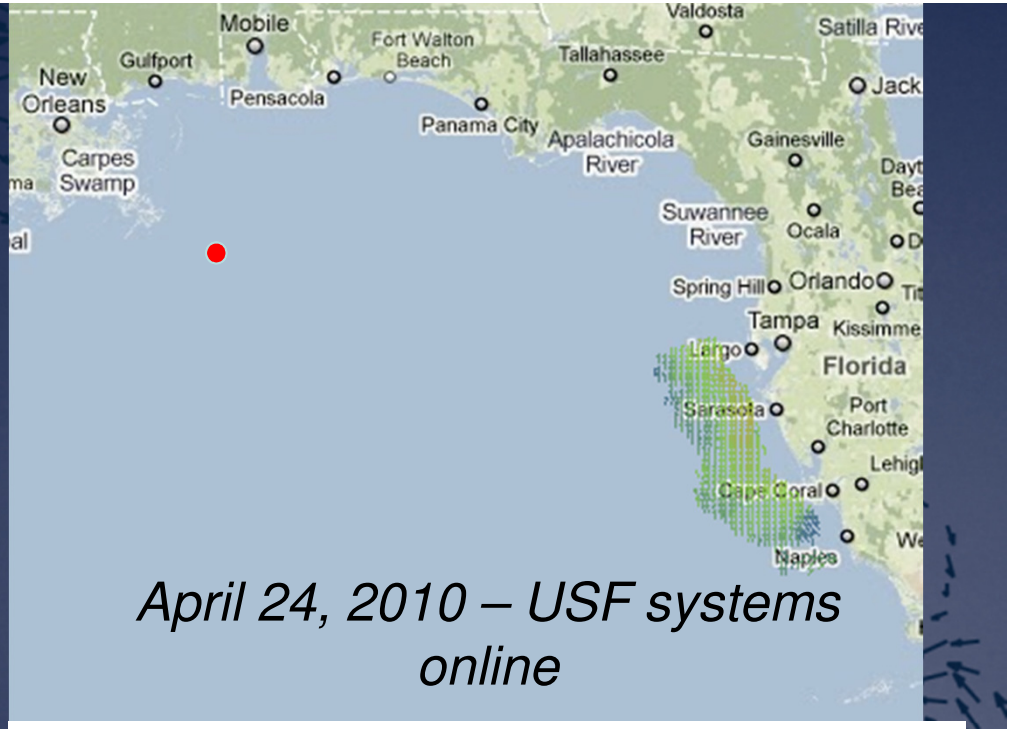
Overlay of HF radar surface currents with hyperspectral imagery from a natural seep near a platform



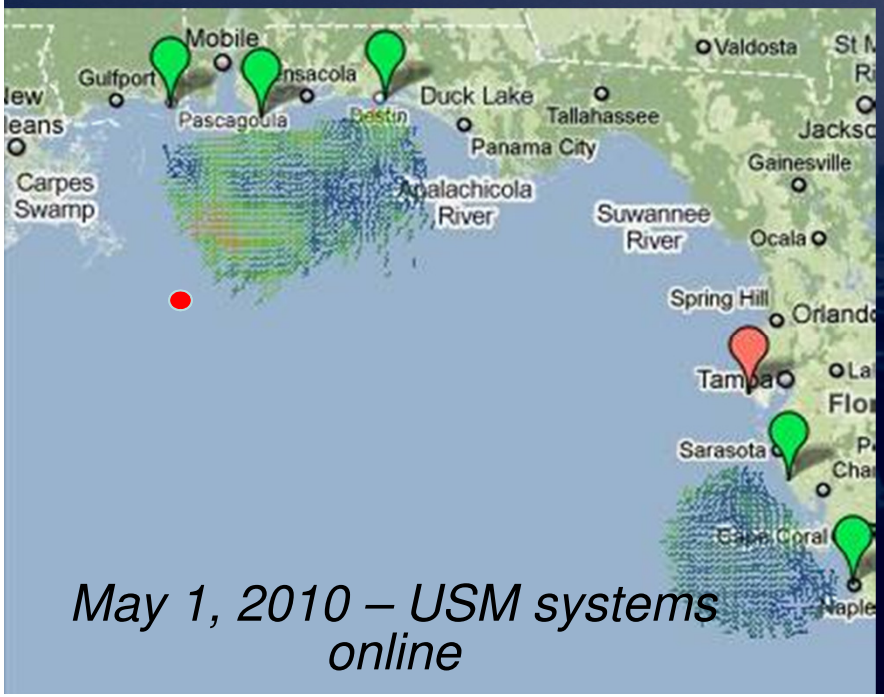
Oil spill response: OSPR-generated response exercise map with integrated HFR surface current data (arrows show speed and direction)



April 20, 2010 – no systems operating



April 24, 2010 – USF systems online



May 1, 2010 – USM systems online

HF Radar National Network (HFRNet) – Coastal Observing Research and Development Center at Scripps Institution of Oceanography – PI Dr. Eric Terrill eterrill@ucsd.edu

- *British Petroleum (BP) Incident Command Center (ICC)*

NOAA IOOS liason: Dr. Jack Harlan jack.harlan@noaa.gov

- *Office of Response and Restoration (OR&R) Emergency Response Division (ERD)*

(formerly Hazardous Materials Response Division (HAZMAT))
Official NOAA forecasts for oil spill trajectories General NOAA Operational Modeling Environment (GNOME)

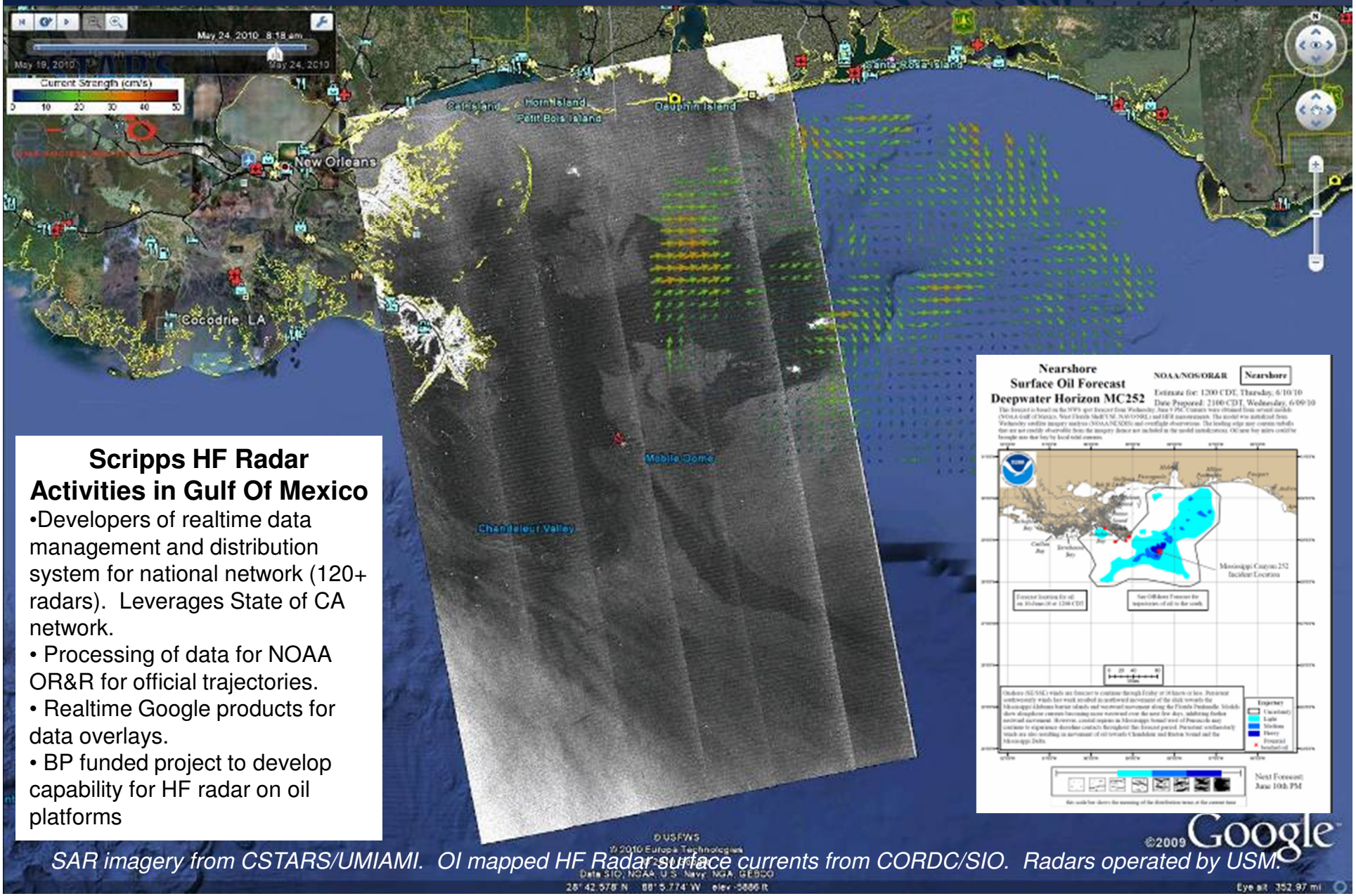
- *Office of Response and Restoration (OR&R) Assessment and Restoration Division (ARD)*

GIS shape files of HFR products and a data feed to the Environmental Response Management Application (ERMA)

- Near real-time currents available in various formats (NetCDF, GNOME NetCDF, Shapefile, kml): http://cordc.ucsd.edu/projects/mapping/
- Near real-time currents available via THREDDS at NDBC: http://sdf.ndbc.noaa.gov:8080/thredds/catalog.html

Mapping Surface Currents in Gulf of Mexico with HF Radar

Scripps Point of Contact: Eric Terrill (eterrill@ucsd.edu)
www.cordc.ucsd.edu/projects/mapping



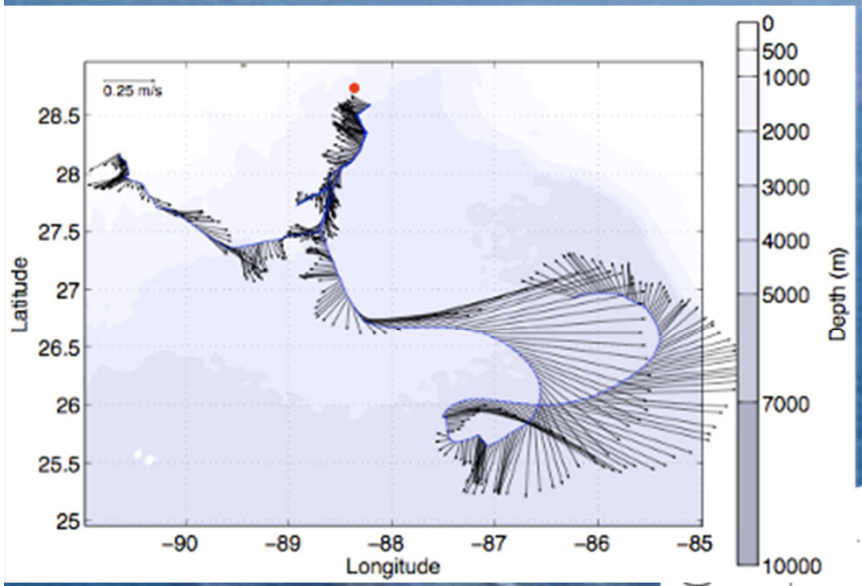
Scripps HF Radar Activities in Gulf Of Mexico

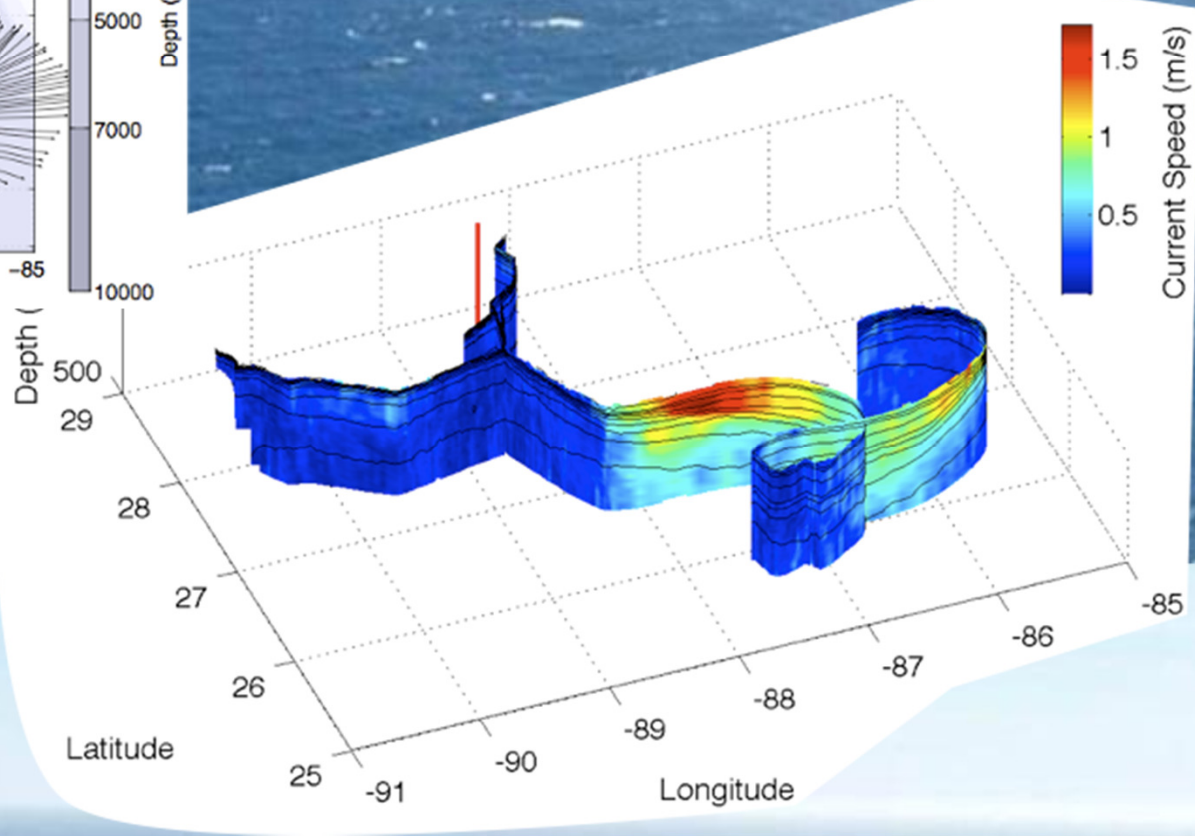
- Developers of realtime data management and distribution system for national network (120+ radars). Leverages State of CA network.
- Processing of data for NOAA OR&R for official trajectories.
- Realtime Google products for data overlays.
- BP funded project to develop capability for HF radar on oil platforms

SAR imagery from CSTARS/UMIAMI. OI mapped HF Radar surface currents from CORDC/SIO. Radars operated by USM.

Subsurface Monitoring Using Autonomous Vehicles

June 7 - July 26, 2010





Case Study 2: Outfall and Coastal Plume Tracking

- Hyperion Treatment Plant Diversion
- SF Ocean Beach Outfall Accidental Release
- Tijuana River Plume Tracking
- South Bay Ocean Outfalls
- Orange County Sanitation District Outfall Diversion (Sept. 14 – present)

CeNCOOS

Sept. 24, 2012

Southern California Coastal Ocean Observing System

2006 Hyperion Ocean Outfall Diversion

http://www.sccoos.org/projects/hyperion/

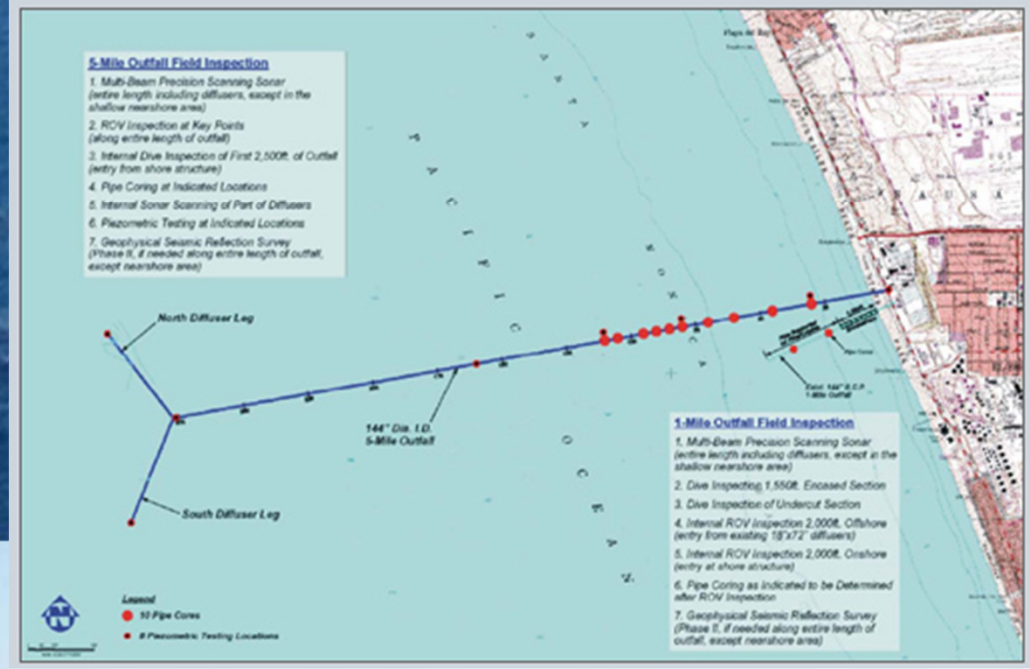
Real-time tracking: Los Angeles Hyperion sewage outfall diversion

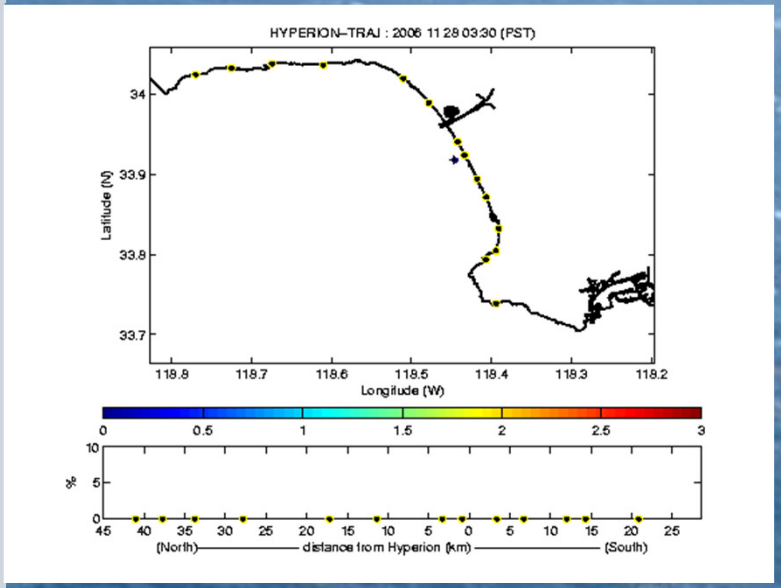
FOR THE HYPERION 5-MILE OUTFALL INSPECTION

November 28-30, 2006

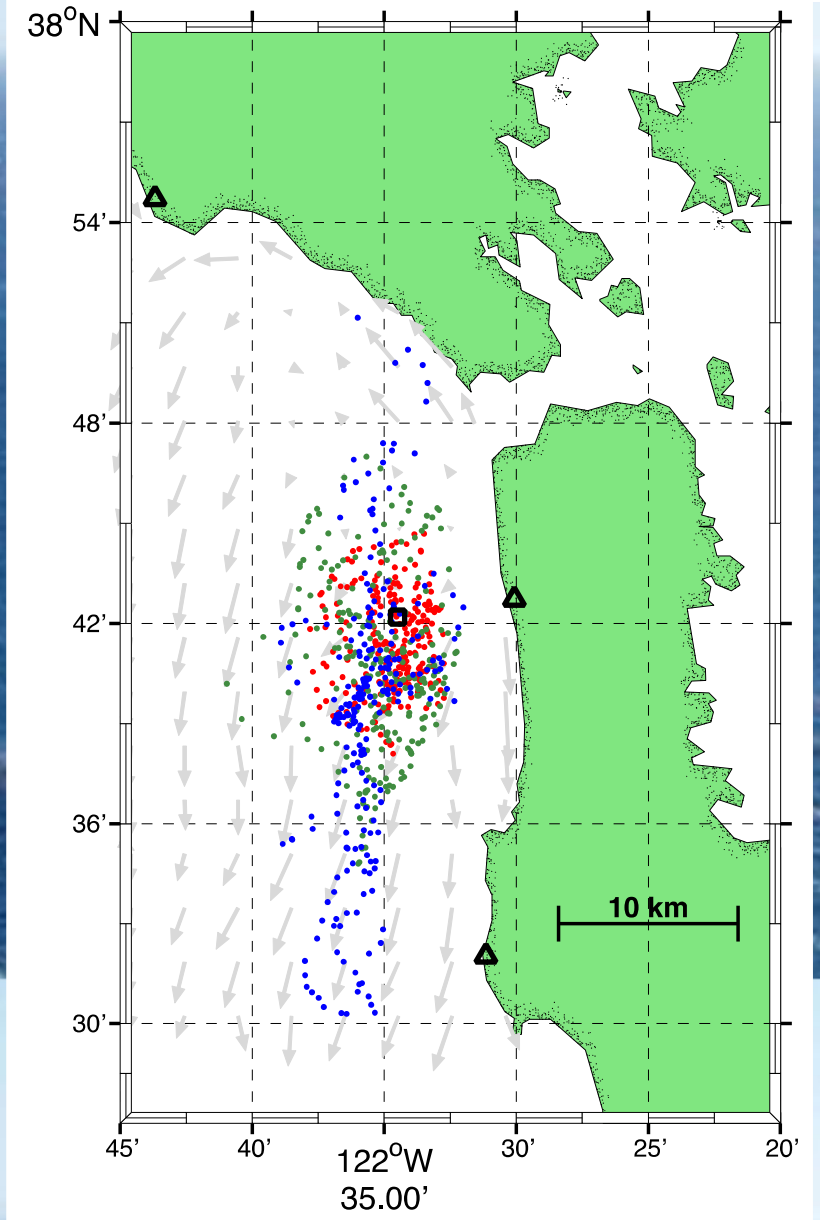
Geography of the Hyperion 5-mile diversion

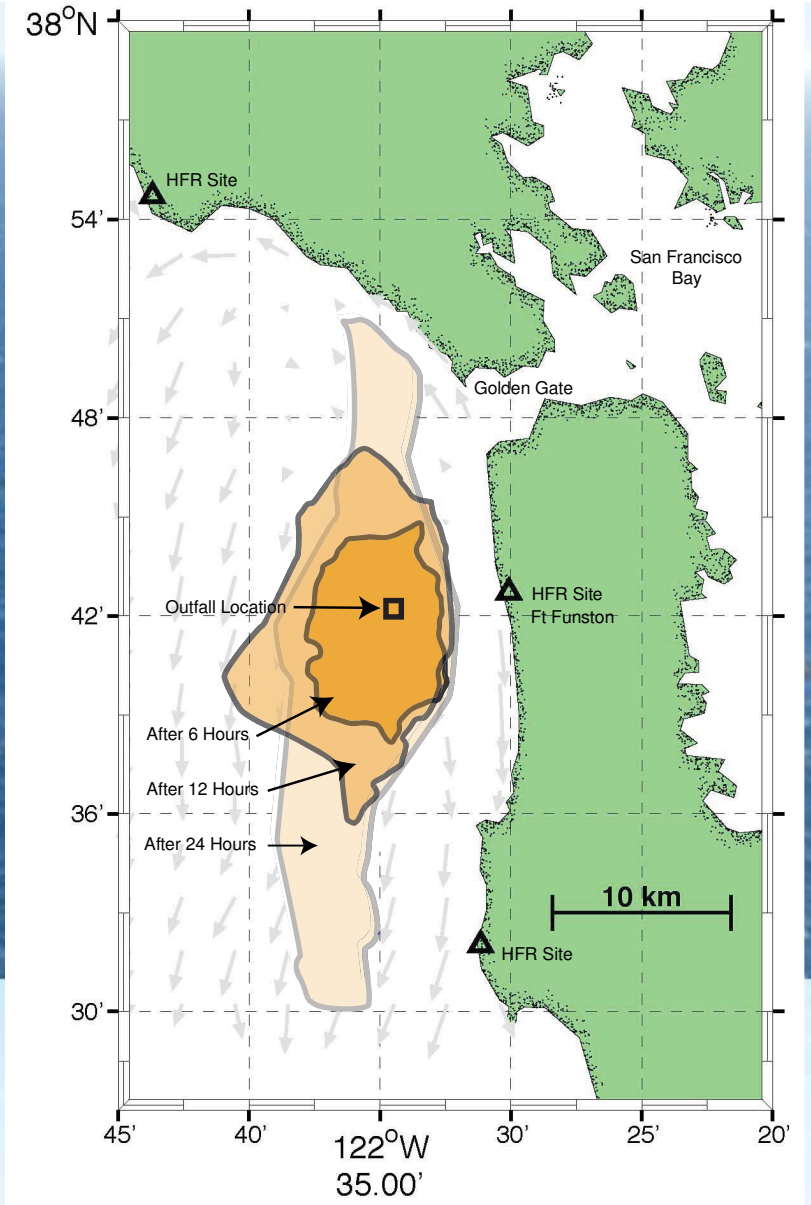
The official City of Los Angeles Department of Public Works website.





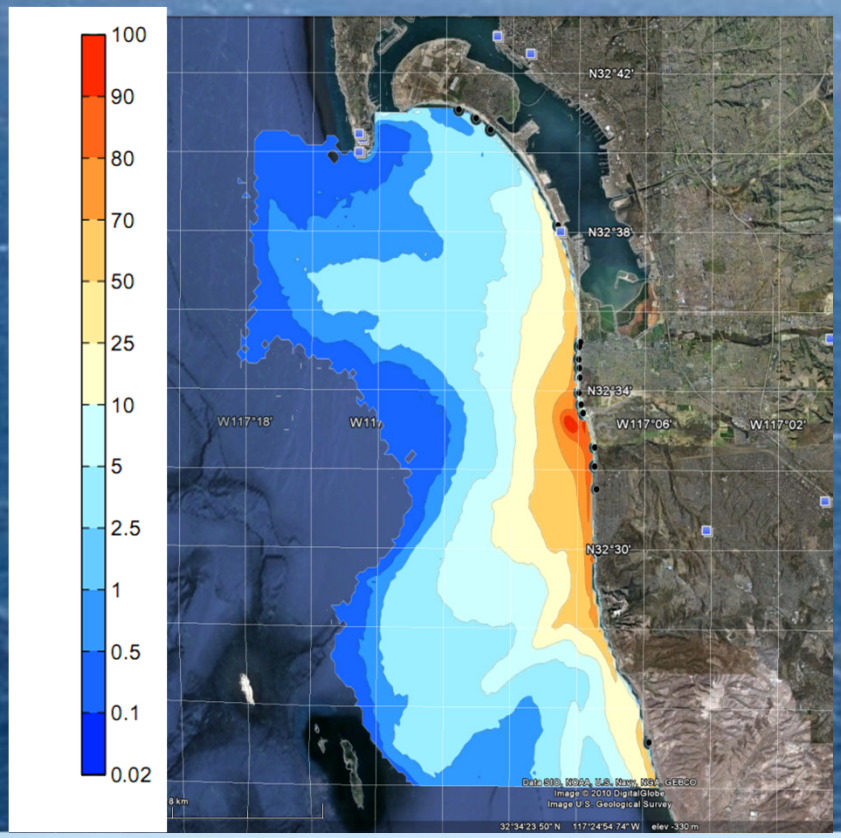
SF Sewage District Ocean Beach Outfall Discharge October, 2007





Coastal Plume Tracking Tijuana River

http://www.sccoos.org/data/tracking/IB/



Stormwater Plume Tracking

UTC Time: 2010-04-28 21:19:39
Local Time: 2010-04-28 14:19:39

Tijuana River Flow Rate

Latest Observations	24hr Maximum	24hr Minimum
28.99 MGD	41.31 MGD	28.99 MGD
1.27 cm/s	1.81 cm/s	1.27 cm/s
2010-04-28 13:15:00 UTC	2010-04-27 20:15:00 UTC	2010-04-27 15:30:00 UTC

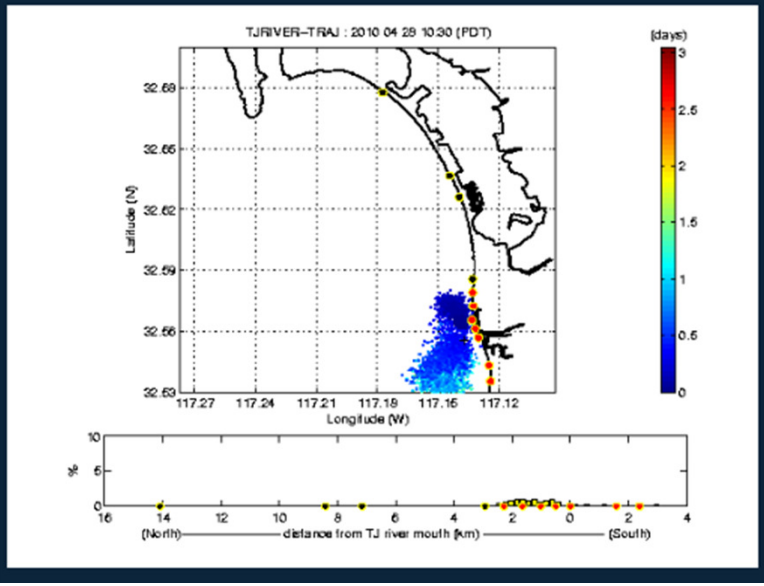
MGD = Millions of gallons per day. cm/s = Cubic meters per second.
Values in red indicate the data is greater than 24 hours old. Otherwise values are displayed in black.

Tijuana River Plume Tracking

Start Animation 1/2 sec

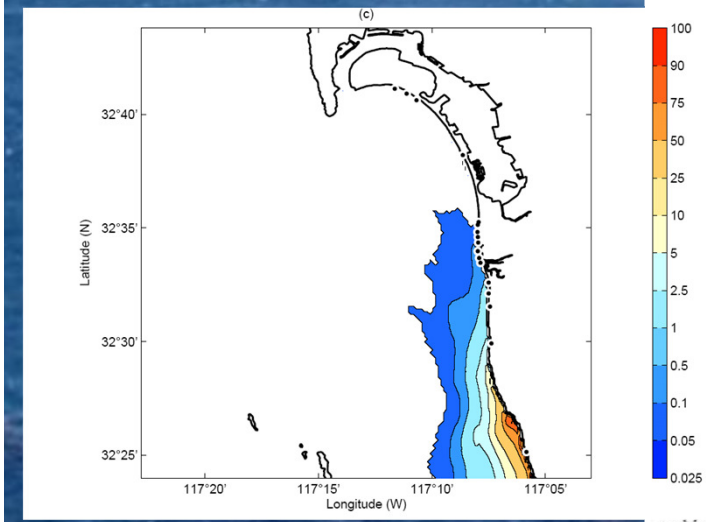
-119	-118	-117	-116	-115	-114	-113	-112	-111	-110	-109	-108
-107	-106	-105	-104	-103	-102	-101	-100	-99	-98	-97	-96
-95	-94	-93	-92	-91	-90	-89	-88	-87	-86	-85	-84
-83	-82	-81	-80	-79	-78	-77	-76	-75	-74	-73	-72
-71	-70	-69	-68	-67	-66	-65	-64	-63	-62	-61	-60
-59	-58	-57	-56	-55	-54	-53	-52	-51	-50	-49	-48
-47	-46	-45	-44	-43	-42	-41	-40	-39	-38	-37	-36
-35	-34	-33	-32	-31	-30	-29	-28	-27	-26	-25	-24
-23	-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12
-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	NOW

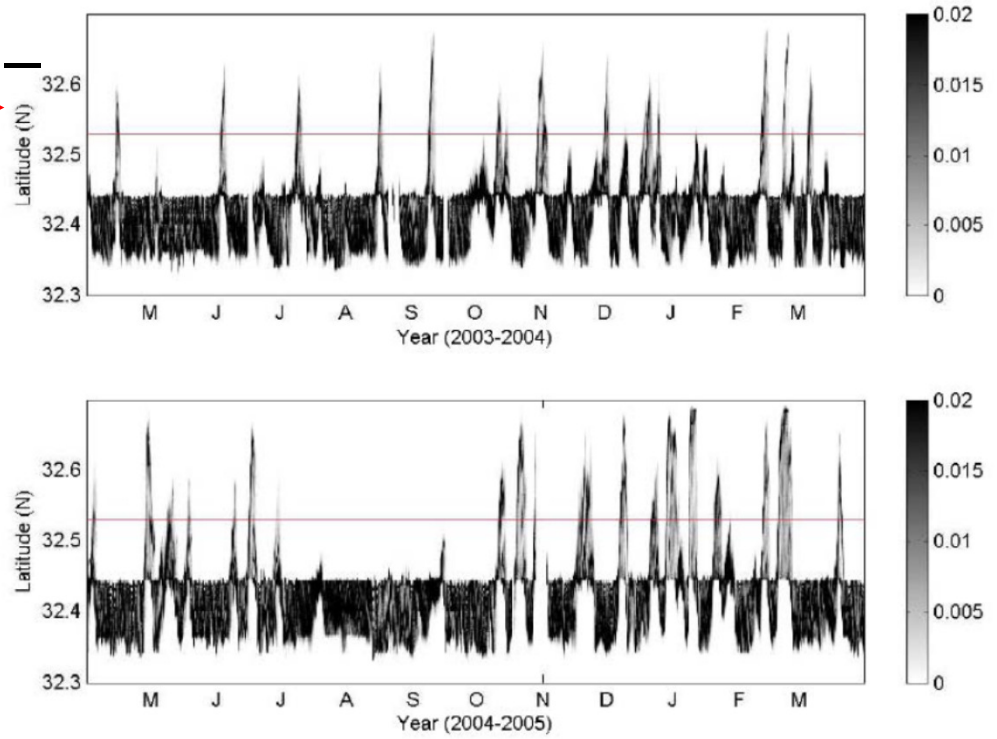
An animated gif has been created as an alternative to this animation sequence.



Coastal Plume Tracking Tijuana River

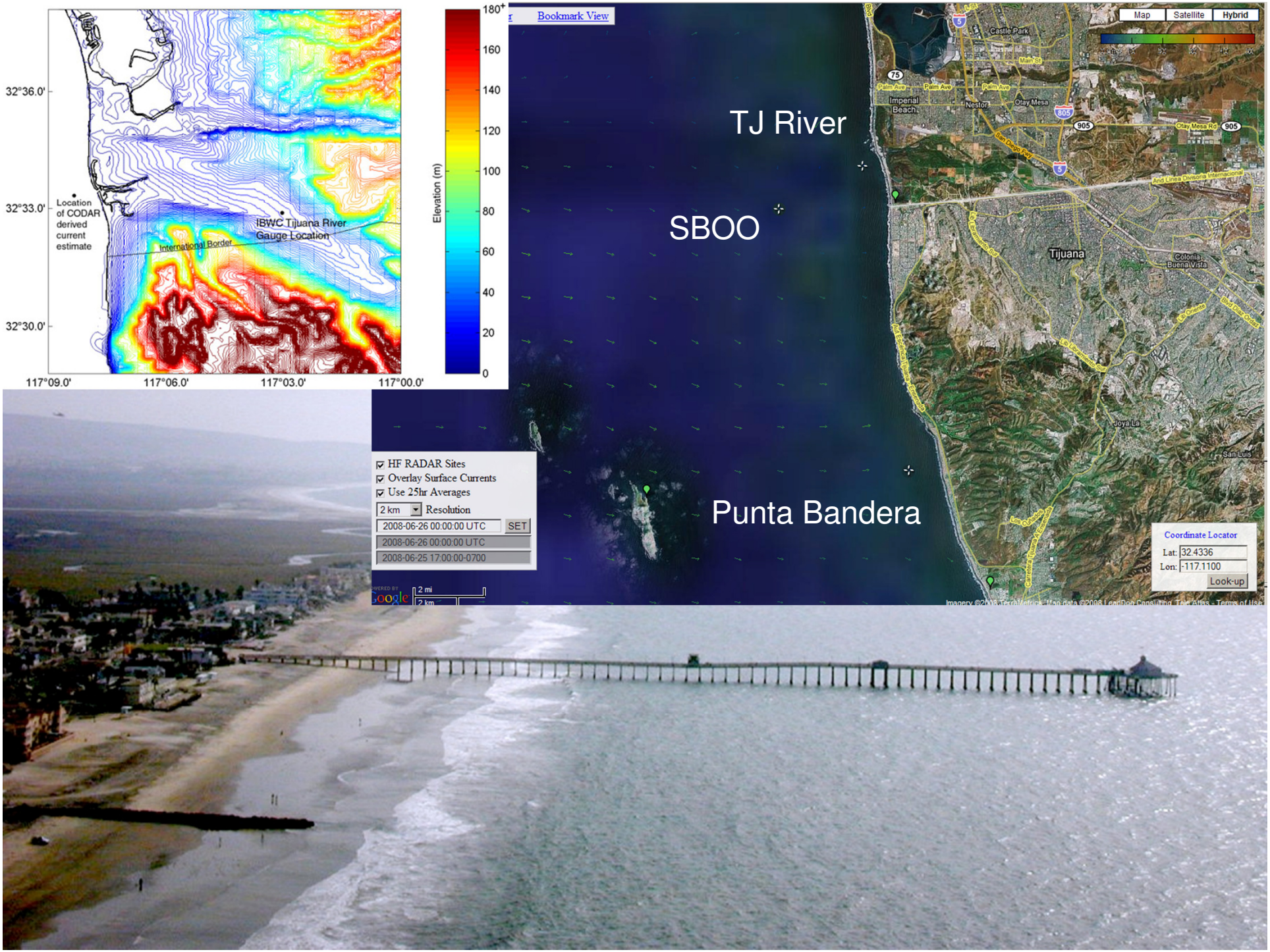
INTERMITTENT SIGNAL – APPROXIMATELY 10% OVER 4 YEARS.

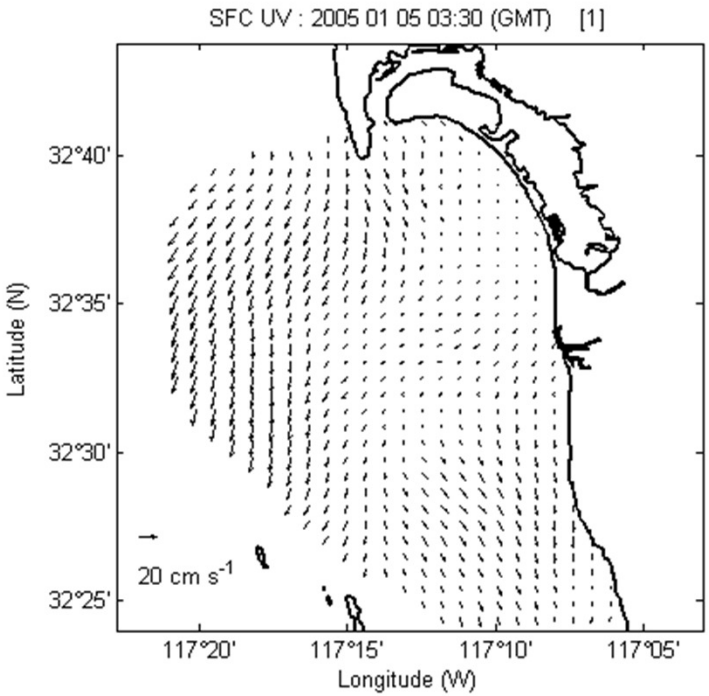


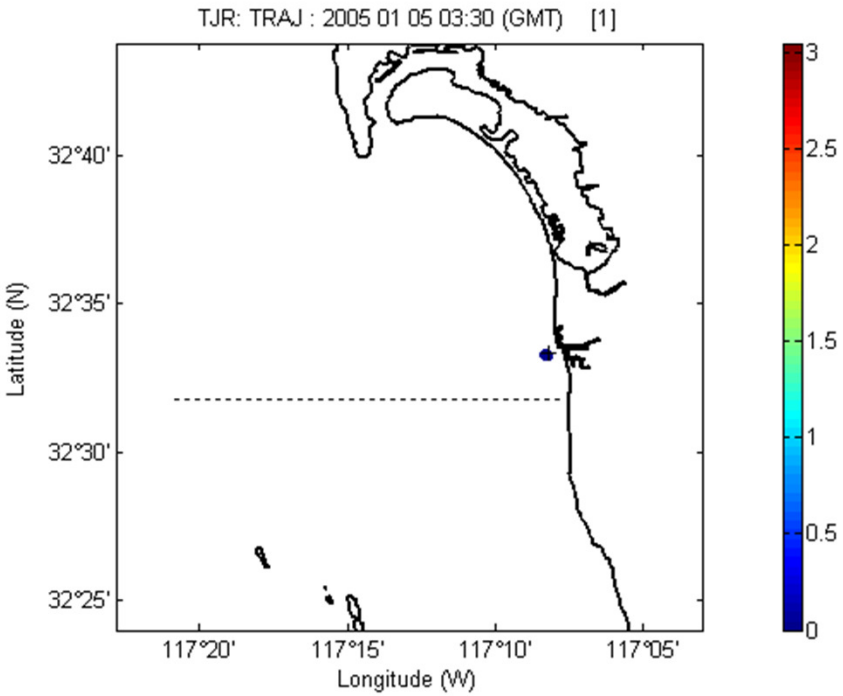


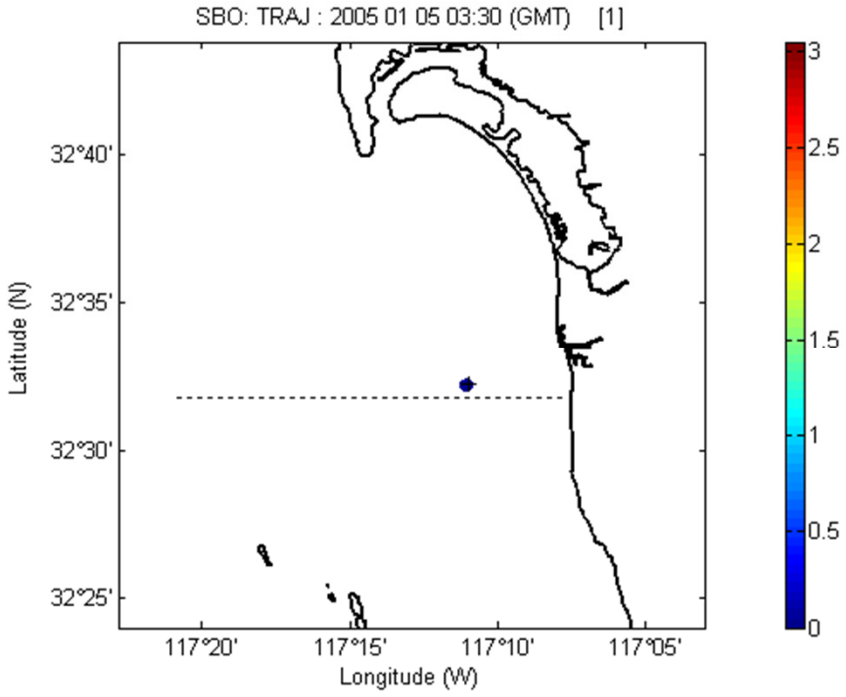
3: Concentration of the particles in latitude based on random walk model. 50 particles are released at every hour, and each particle has 3 days life time. extended border line (red line)

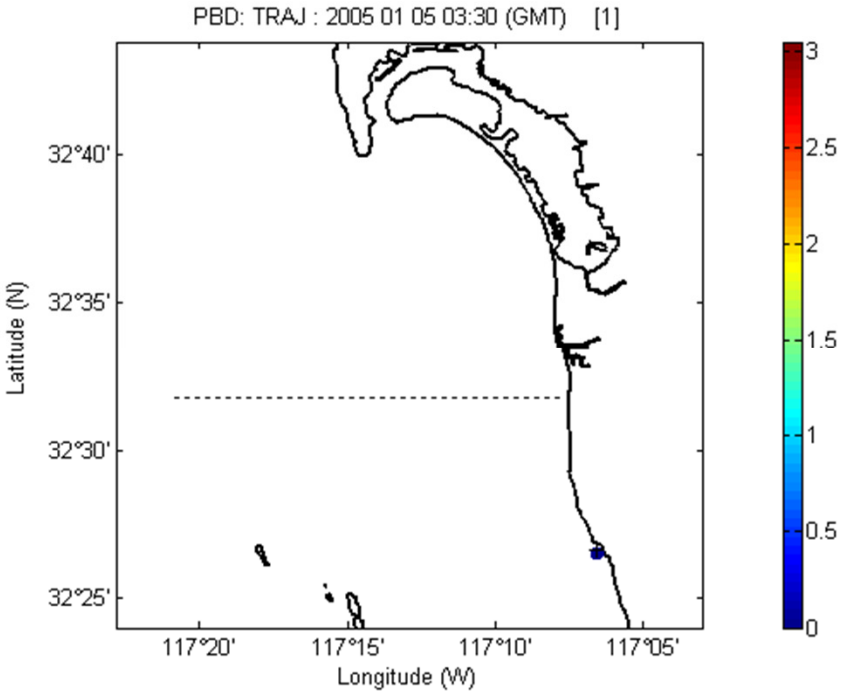
Punta Bandera plume potential modeled for 4 years with HF radar


32°36.0'
32°33.0'
32°30.0'
117°09.0'
117°06.0'
117°03.0'
117°00.0'
Location of CODAR derived current estimate
IBWC Tijuana River Gauge Location
International Border
Elevation (m)
180
160
140
120
100
80
60
40
20
0
Bookmark View
TJ River
SBOO
Punta Bandera
Map
Satellite
Hybrid
Castle Park
Imperial Beach
Nestor
Otay Mesa
Otay Mesa Rd
Tijuana
Colonia Buena Vista
Joya La
San Luis
HF RADAR Sites
Overlay Surface Currents
Use 25hr Averages
2 km
Resolution
2008-06-26 00:00:00 UTC
SET
2008-06-26 00:00:00 UTC
2008-06-25 17:00:00-0700
Coordinate Locator
Lat: 32.4336
Lon: -117.1100
Look-up


SFC UV : 2005 01 05 03:30 (GMT) [1]
32°40'
32°35'
32°30'
32°25'
Latitude (N)
20 cm s-1
117°20'
117°15'
117°10'
117°05'
Longitude (W)


TJR: TRAJ : 2005 01 05 03:30 (GMT) [1]
32°40'
32°35'
32°30'
32°25'
Latitude (N)
117°20'
117°15'
117°10'
117°05'
Longitude (W)
3
2.5
2
1.5
1
0.5
0


SBO: TRAJ : 2005 01 05 03:30 (GMT) [1]
32°40'
32°35'
32°30'
32°25'
Latitude (N)
117°20'
117°15'
117°10'
117°05'
Longitude (W)
3
2.5
2
1.5
1
0.5
0


PBD: TRAJ : 2005 01 05 03:30 (GMT) [1]
32°40'
32°35'
32°30'
32°25'
Latitude (N)
117°20'
117°15'
117°10'
117°05'
Longitude (W)
3
2.5
2
1.5
1
0.5
0

South Bay Ocean Outfall Mooring

- June 19, 2007 Mooring Deployment
- January 15, 2007 Mooring Refurbishment

CeNCOOS

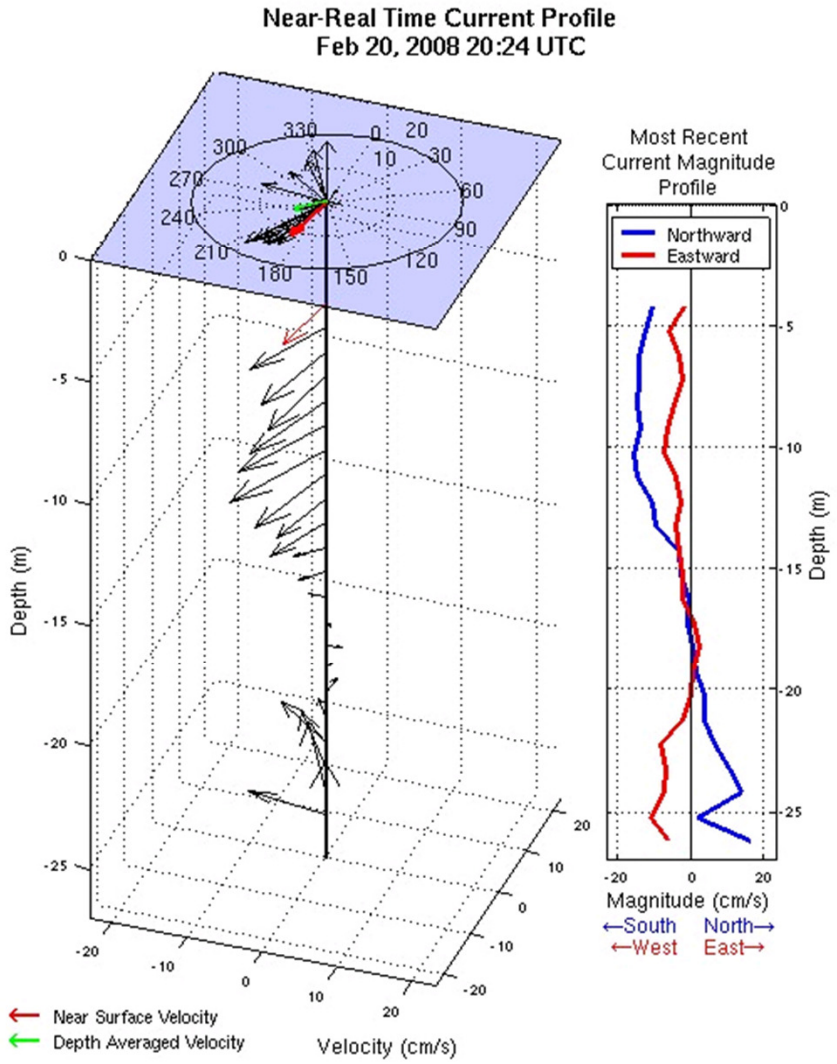
Sept. 24, 2012

Southern California Coastal Ocean Observing System

SBOO Mooring Near Real-time Data

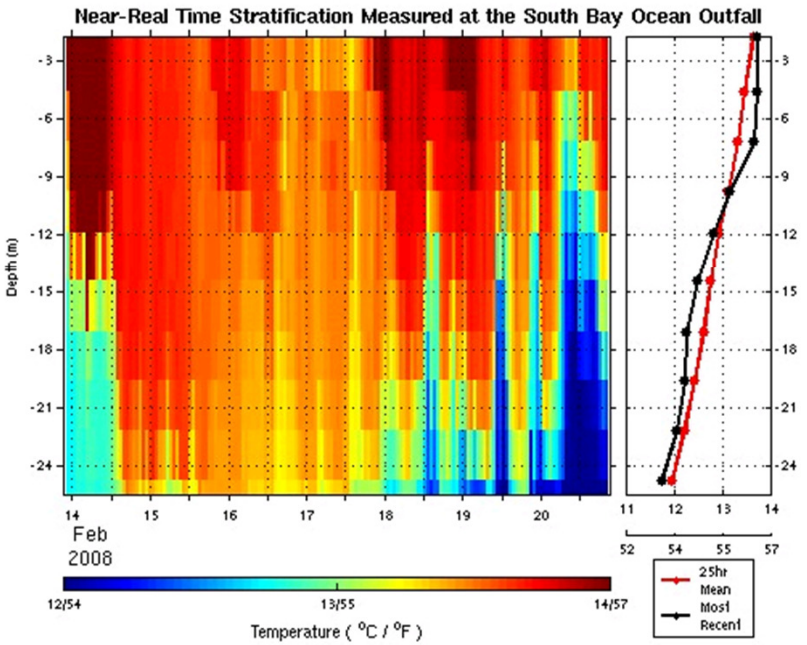
South Bay Ocean Outfall
Current Profile

UTC Time: 2008-0
Local Time: 2008-0



South Bay Ocean Outfall
Ocean Stratification

UTC Time: 2008-02-20 21:36:11
Local Time: 2008-02-20 13:36:11



Last Sample Values

Depth	Temp. °C	Temp °F
1.7 m	13.73 °C	56.71 °F
4.6 m	13.72 °C	56.70 °F
7.2 m	13.66 °C	56.59 °F
9.8 m	13.16 °C	55.69 °F
11.9 m	12.83 °C	55.09 °F
14.4 m	12.49 °C	54.48 °F
17.1 m	12.26 °C	54.07 °F
19.6 m	12.22 °C	54.00 °F
22.2 m	12.05 °C	53.69 °F
24.8 m	11.74 °C	53.13 °F

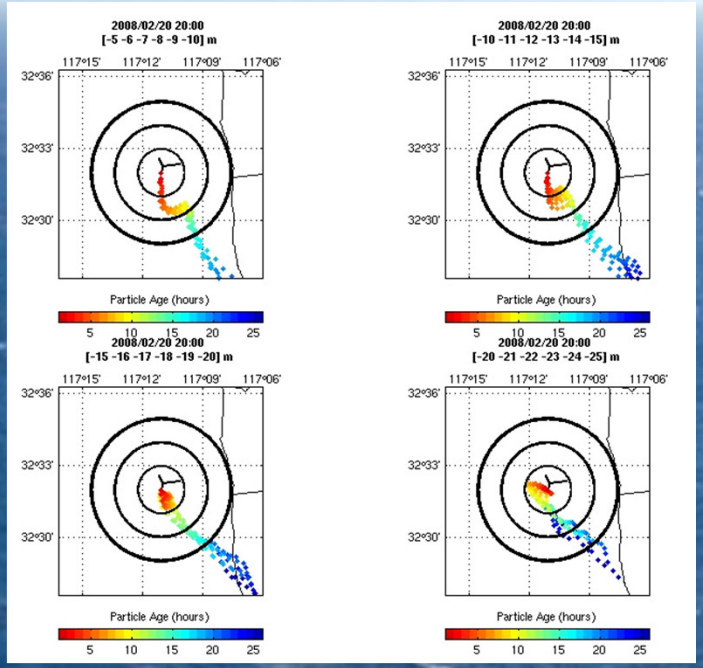
2008-02-20 20:29:25 GMT

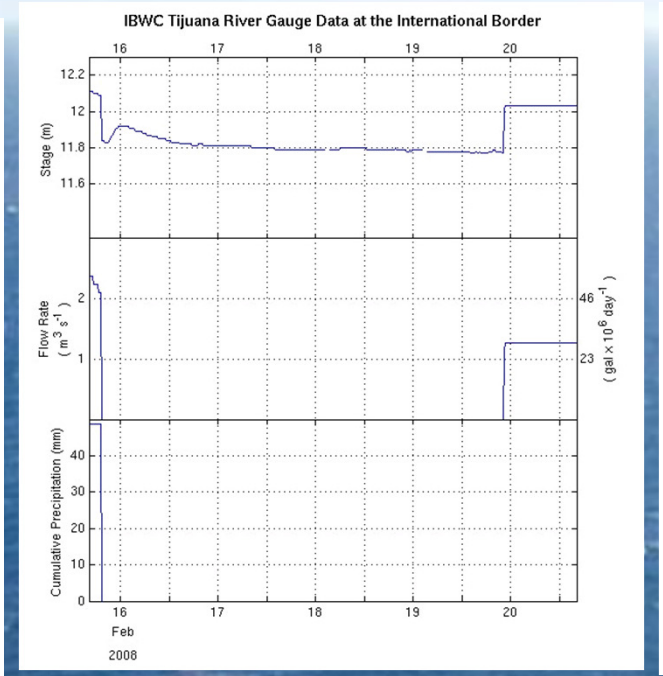
Autonomous Underwater Vehicle

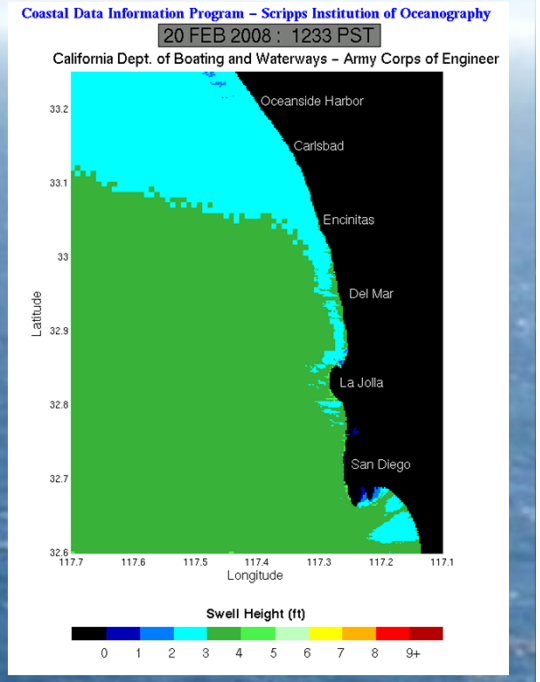
- REMUS Payload
  - Conductivity, Temperature, Depth (CTD)
  - Colored Dissolved Organic Matter (CDOM)
  - Compass
  - GPS
  - Iridium communications
  - Onboard navigation system

CTD and Optical Package

Autonomous Under Water Vehicle Mission Planning: Environmental Assessment







Trajectory estimates of depth averaged current velocity

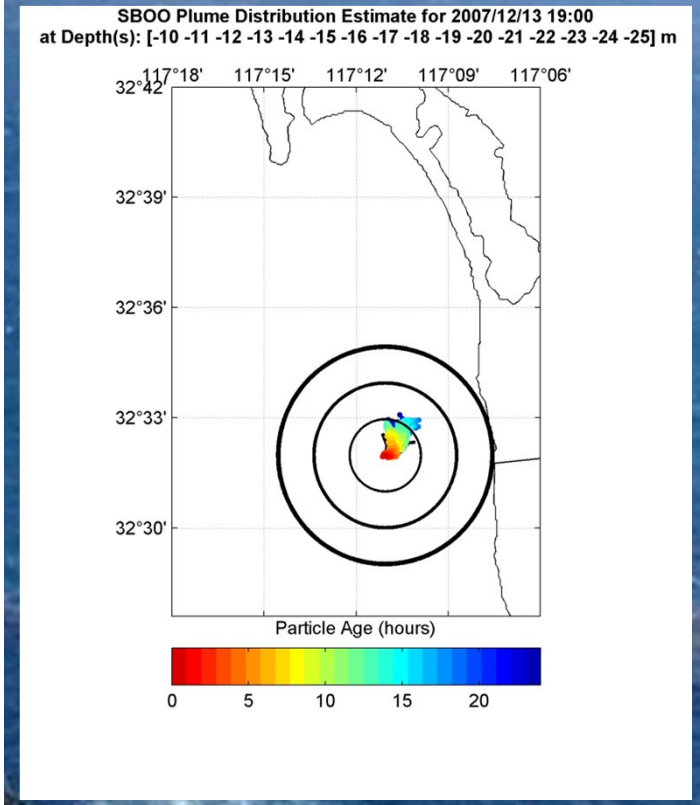
Time series of IBWC TJ River Gauge and Rainfall

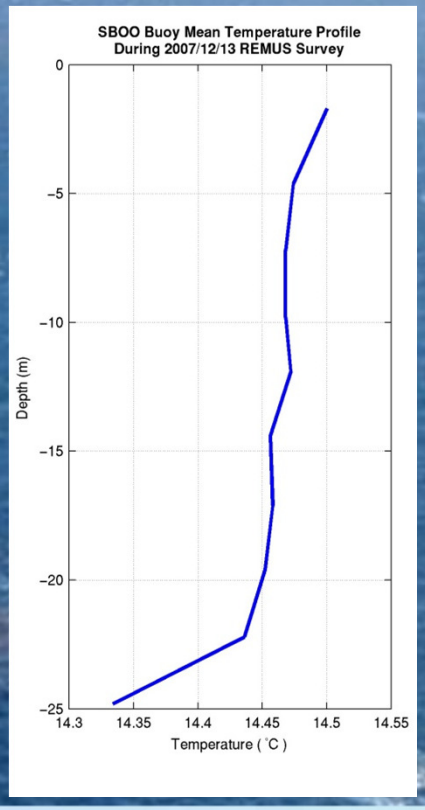
CDIP Swell Model

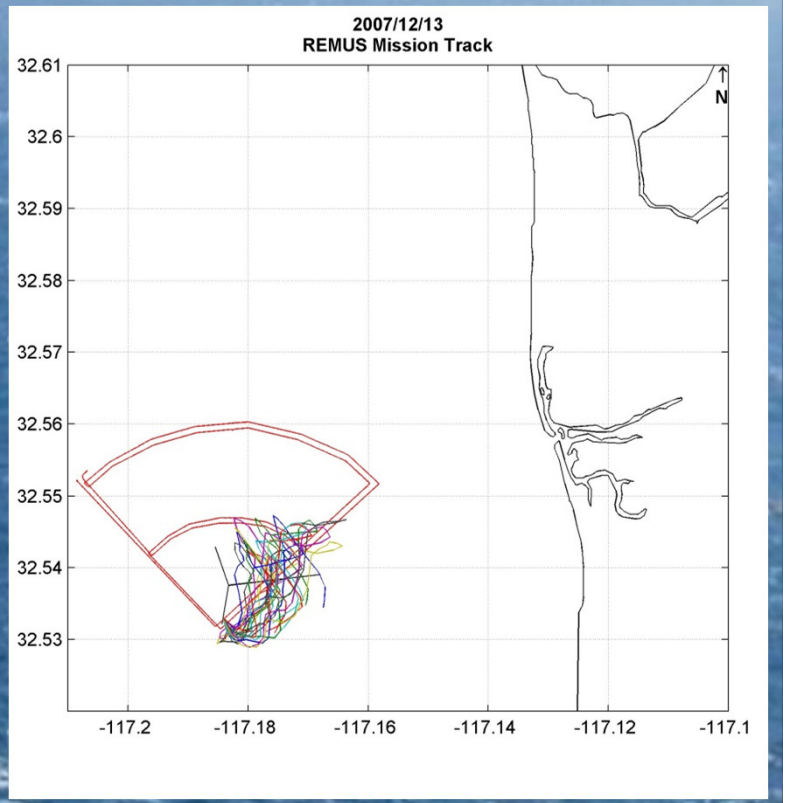
Sept. 24, 2012

South Bay Ocean Outfall Survey

December 13, 2007







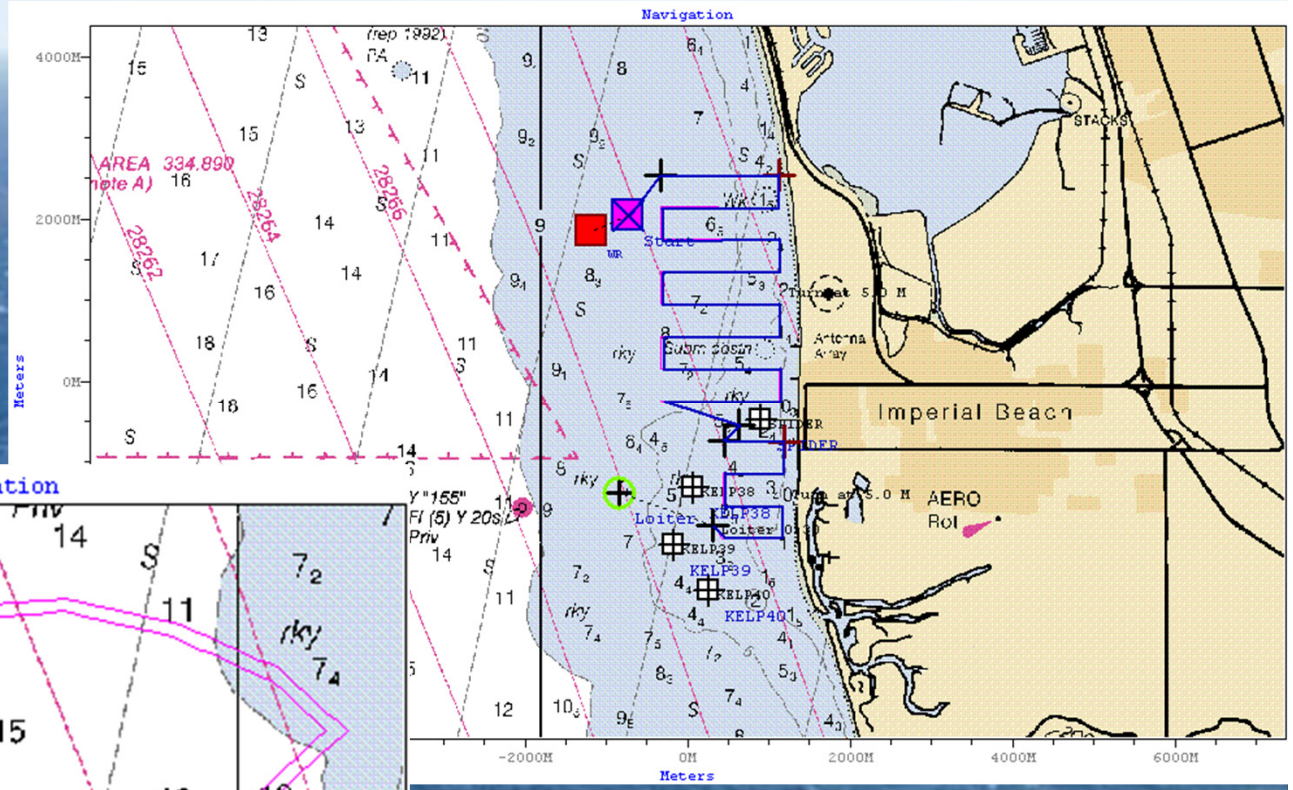
CeNCOOS

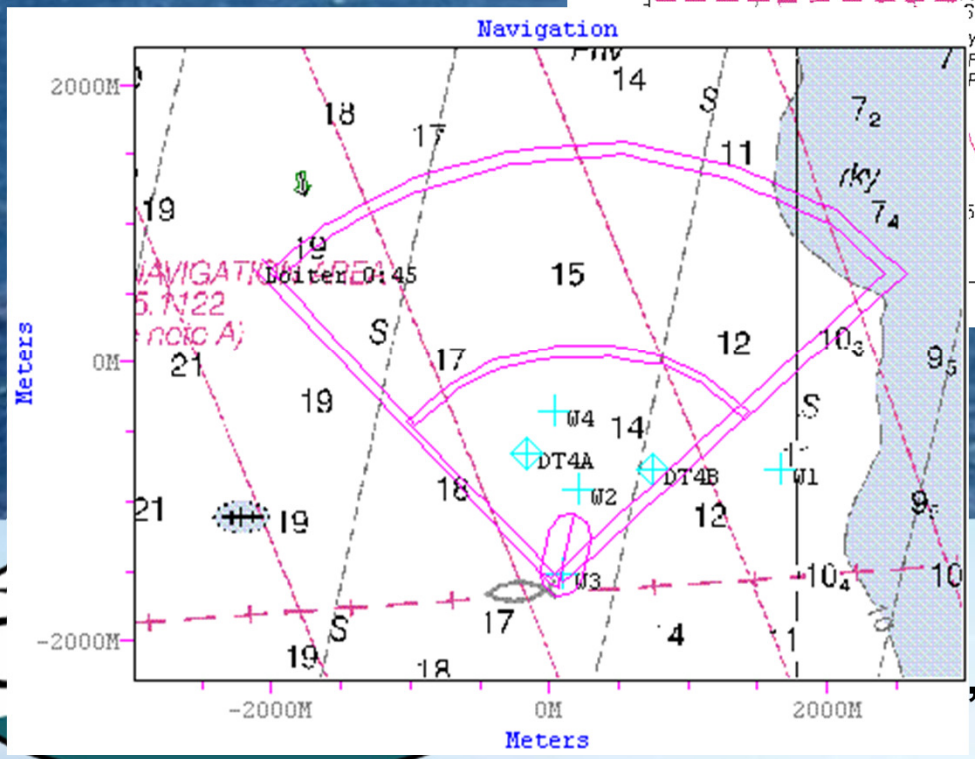
Sept. 24, 2012

Southern California Coastal Ocean Observing System

South Bay Ocean Outfall Mission Planning

Tijuana River Mission – Currents to North

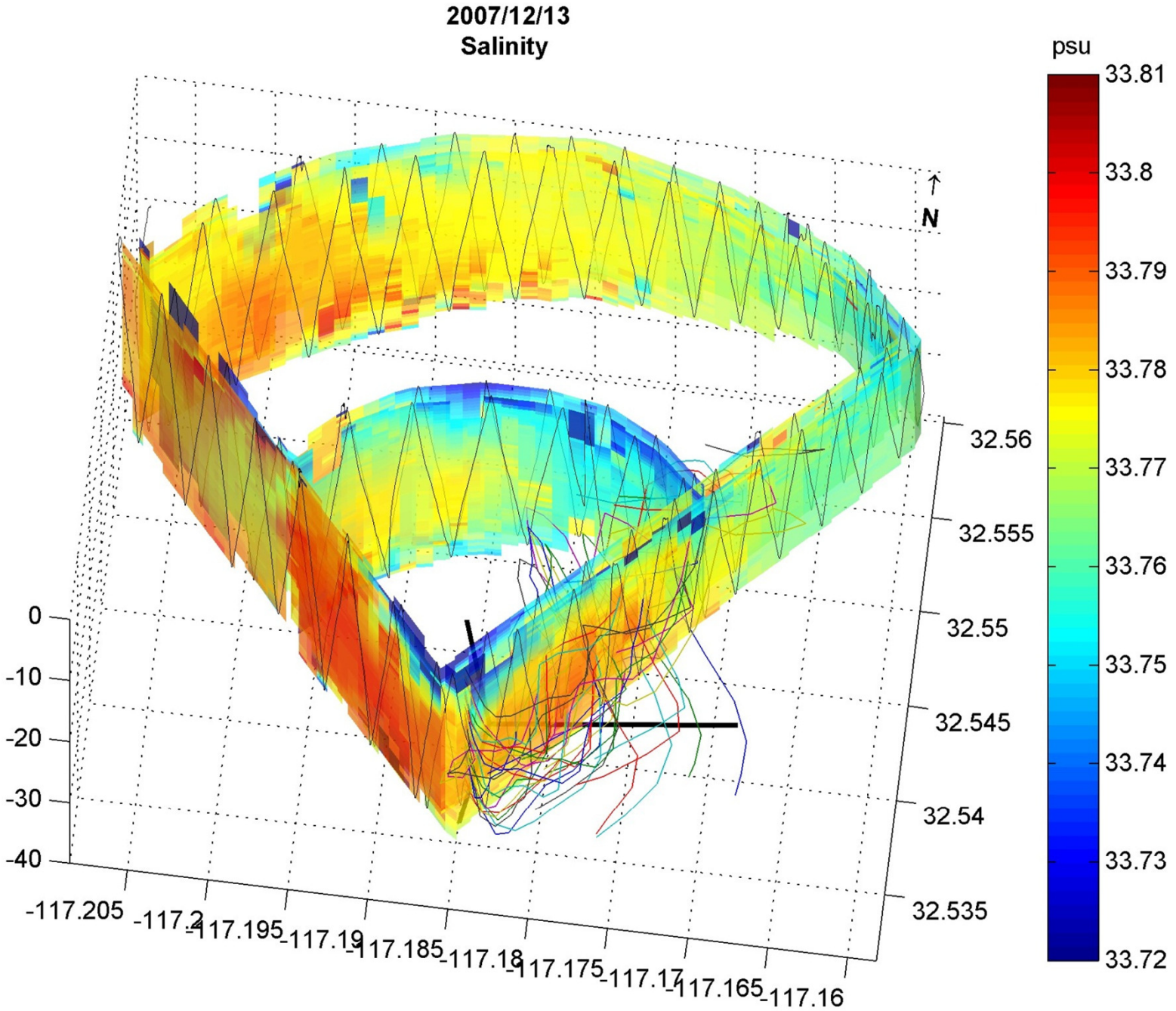




, 2012

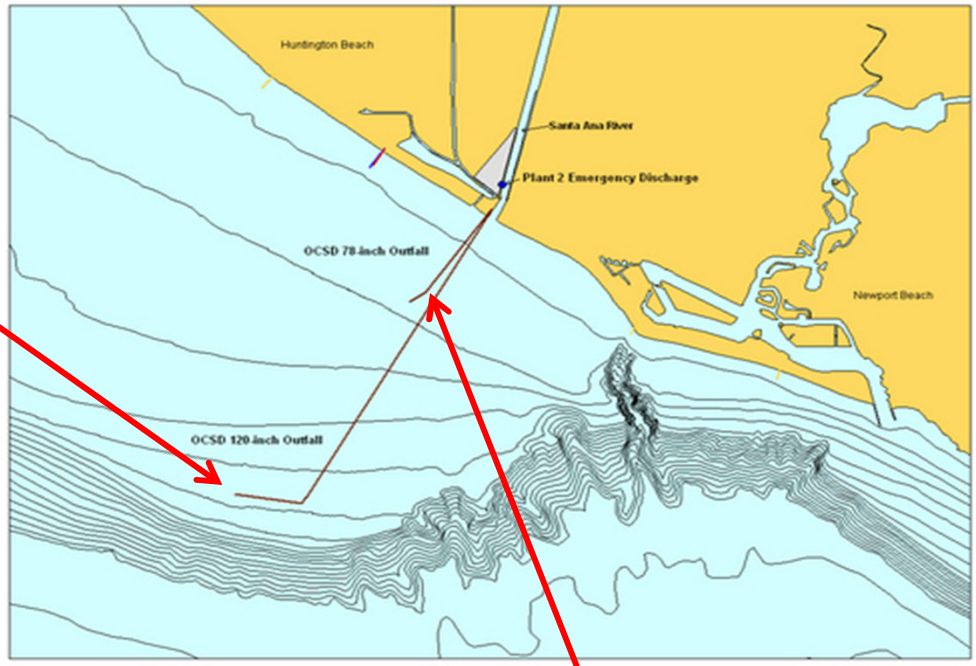
South Bay Ocean Outfall Mission – Currents to Nor

SOUTHERN CALIFORNIA COASTAL OCEAN OBSERVING SYSTEM


2007/12/13
Salinity
psu
33.81
33.8
33.79
33.78
33.77
33.76
33.75
33.74
33.73
33.72
N
0
-10
-20
-30
-40
-117.205
-117.2
-117.195
-117.19
-117.185
-117.18
-117.175
-117.17
-117.165
-117.16
32.56
32.555
32.55
32.545
32.54
32.535

2012 Orange County Sanitation District (OCSD) Ocean Outfall Diversion

The Orange County Sanitation District (OCSD) discharges its treated effluent from a 120-inch ocean outfall that terminates in 200 feet of water, approximately 4.5 miles offshore Newport Beach and Huntington Beach.

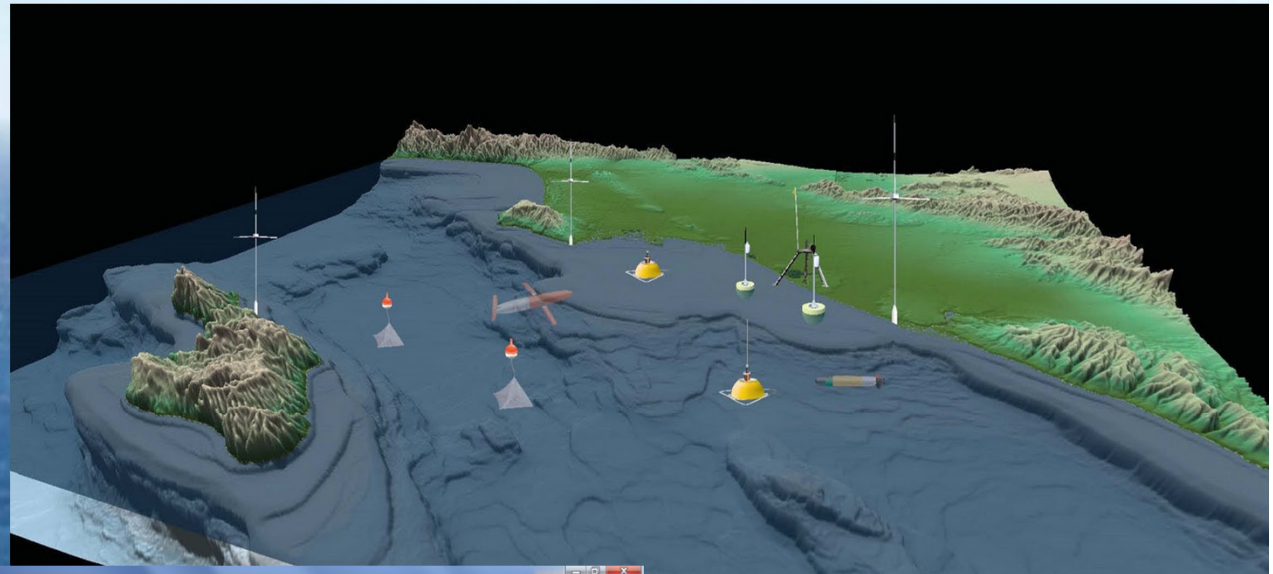


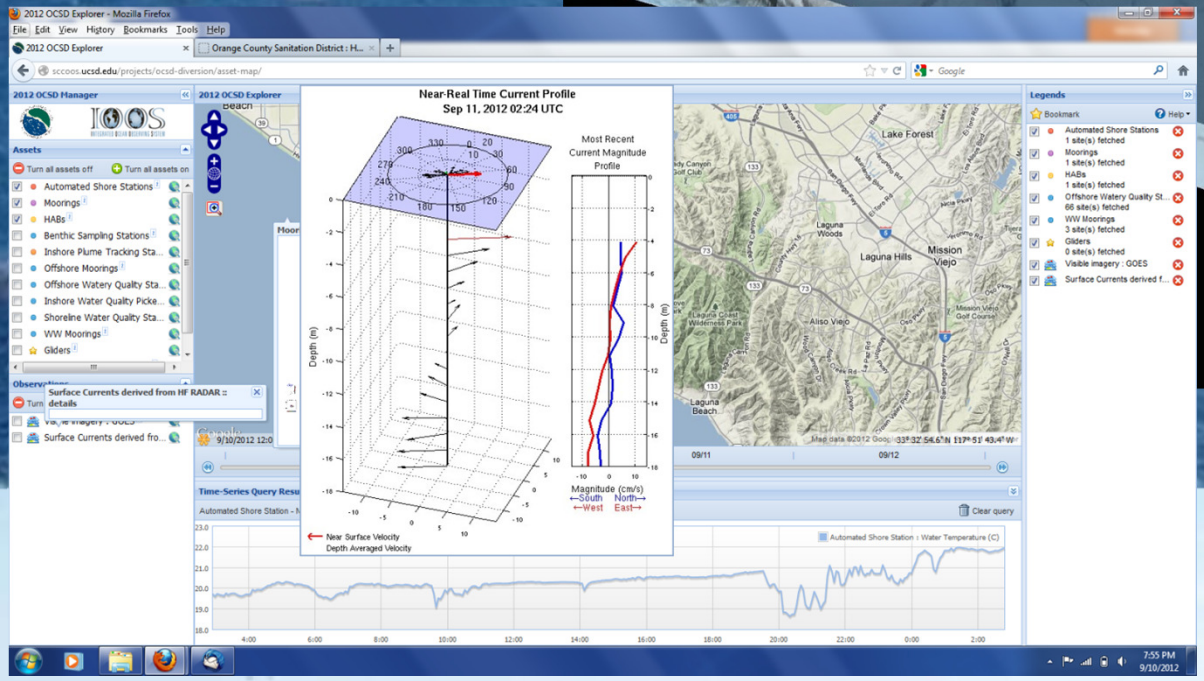
On September 14, 2012 OCSD diverted the flow from the 120-inch outfall to the 78-inch outfall as part of a project to inspect, assess, and rehabilitate the Outfall Land Section and Ocean Outfall Booster Pump Station Piping.

The District has a secondary, 78-inch outfall located in about 60 feet of water, 1 mile off the coast. Periodically, OCSD request special permits to divert effluent from the 120-inch pipe to the 78-inch pipe for emergency purposes and planned maintenance projects.

2012 OCSD Ocean Outfall Diversion

Asset Map and Visualization
Moorings, gliders, HF radar, casts, Samples ….





Case Study 3: Water Quality & Mariculture

Water quality parameters of concern include:

- Presence of harmful algal blooms
- Chlorophyll concentration
- Dissolved oxygen concentration
- pH

Growers can respond to different conditions by

- Changing the timing of spawning
- Changing timing of harvesting
- Moving crop vertically in the water column

Sept. 24, 2012

Abalone and HABS in Monterey Bay

- On Sept. 10, 2007, Monterey Abalone Company lost ~$60,000 worth of abalone to a “red tide” event caused by the dinoflagellate Cochlodinium
- On Oct. 9, the Company identified a second patch of *Cochlodinium*, and averted a second crop loss by lowering the abalone to the bottom, removing them from the impacted surface waters
- By identifying this as an unusual “weather” event using CeNCOOS wind, temperature, and satellite ocean color, the Company was able to collect Federal crop insurance to cover the loss.

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Southern California Coastal Ocean Observing System

Abalone and HABS in Monterey Bay

- Scientists are using observing system data to develop statistical models to learn under what conditions HAB events are most likely, so they can be predicted in the future.
- To supplement weekly HABs sampling already being done there, CeNCOOS recently installed an automated WQ station on Monterey Wharf to measure T, S, DO, pH, chlorophyll fluorescence, and turbidity. The Monterey Abalone Company will help maintain the instrumentation.

CeNCOOS

Sept. 24, 2012

Oysters and Chlorophyll in Humboldt Bay

- Mariculture companies (oysters, mussels, clams) in Humboldt Bay started using real-time CeNCOOS chlorophyll fluorescence data in 2003 to understand factors affecting growth rates of their shellfish.
- Using CeNCOOS data on water temperature, salinity and chlorophyll concentration, scientists are building a simple biophysical model of oceanic productivity off Humboldt Bay into a tool for predicting how this productivity (primarily phytoplankton) is delivered to shellfish growing sites.

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Southern California Coastal Ocean Observing System

http://cencoos.humboldt.edu/?content=data_oyster_main

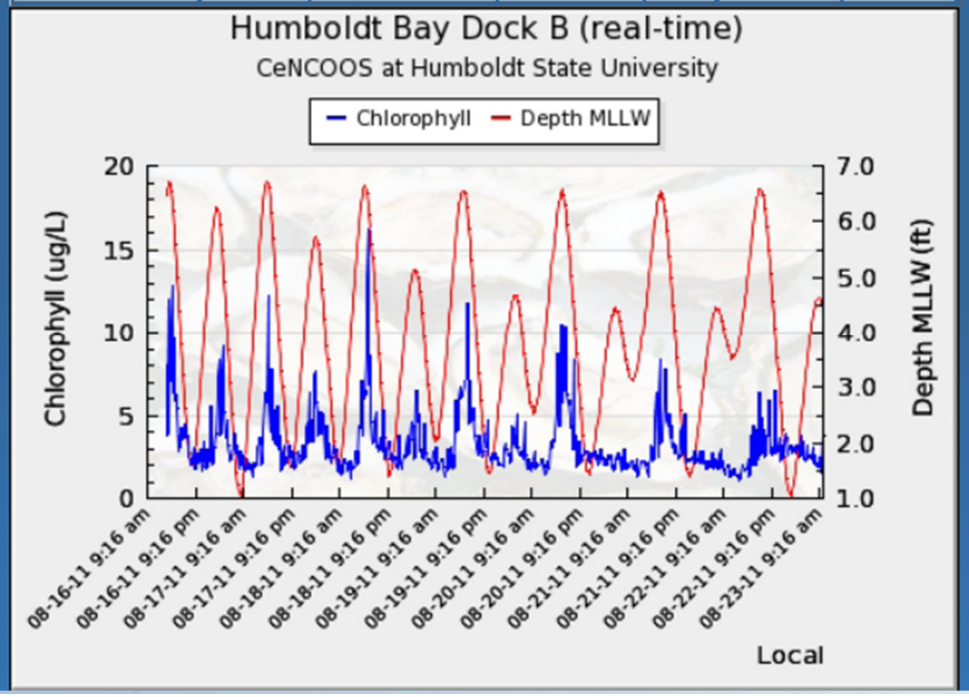
Oyster Conditions

(Humboldt Bay)

DockB | Buoy 46022-Eel River | Buoy 46212-South Spit | Upwelling Index

Latest Observation: *2011-08-23 10:01:49* Local (PST/LDT)

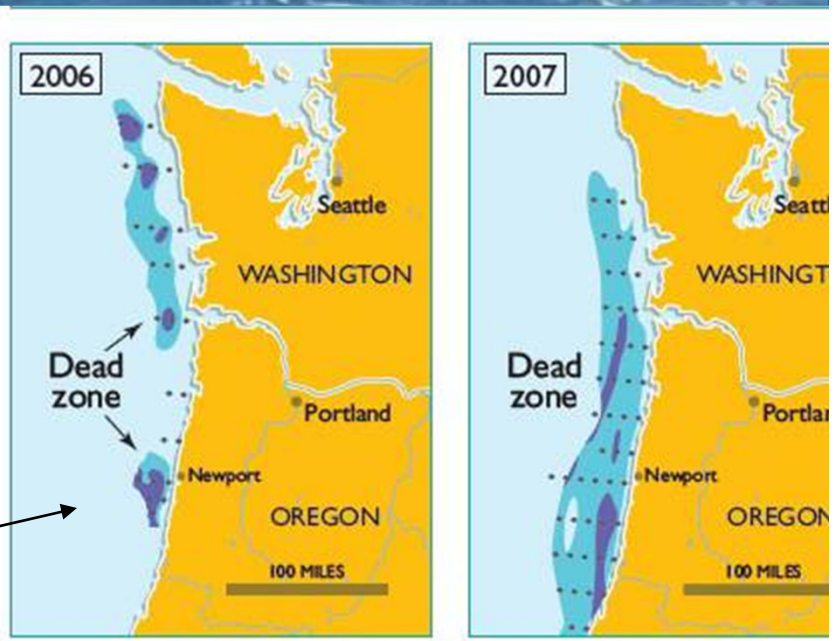
	Temp (C)	Chlorophyll (ug/L)	Salinity (ppt)	pH	Precip (in)	Depth (ft)
Current Value	14.521	3.810	33.840	8.101	0.00	4.482
12 Hour Average	16.52	2.86	33.95	8.06	0.00	2.90
Graph:						



Hypoxia

- Low oxygen events have caused massive fish kills in harbors, like the one in Redondo Beach in March 2011
- Large scale low oxygen areas (also called anoxic or dead zones) have been observed off WA and OR. These have expanded from the continental shelf to near-shore waters every summer since 2002. The close proximity of these dead zones to the shore had never been reported before that year.

Low-oxygen conditions (<1.4 ml/l, blue) and extremely low-oxygen conditions (<0.5 ml/l, purple)



Case Study 4: Areas of Special Biological Significance

Lagoon discharge after rainfall.

Composite of images showing the spatial extent of the Penasquitos Lagoon plume extending southward towards the La Jolla ASBS.

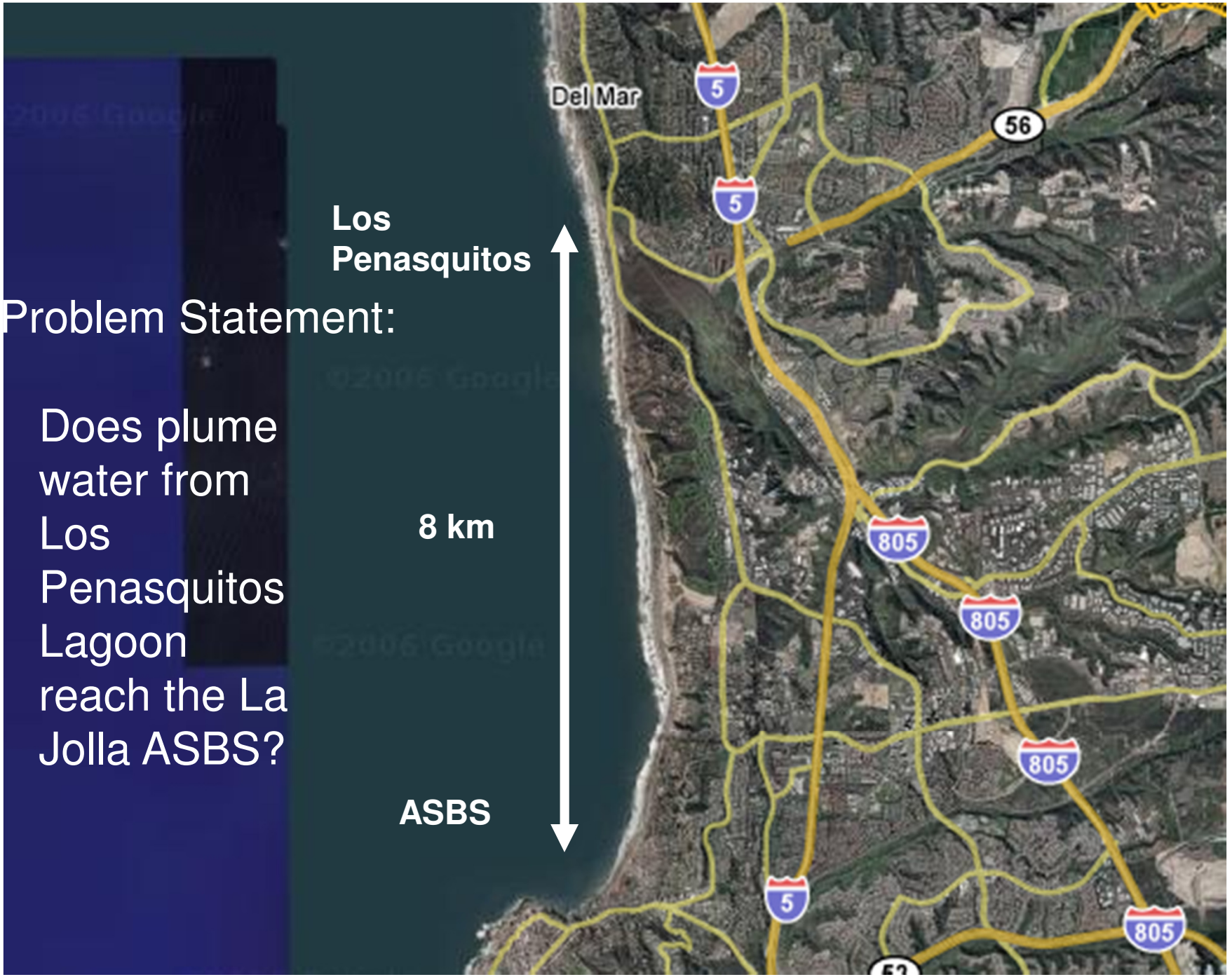
PLUME WATER

LA JOLLA

LAGOON ENTRANCE

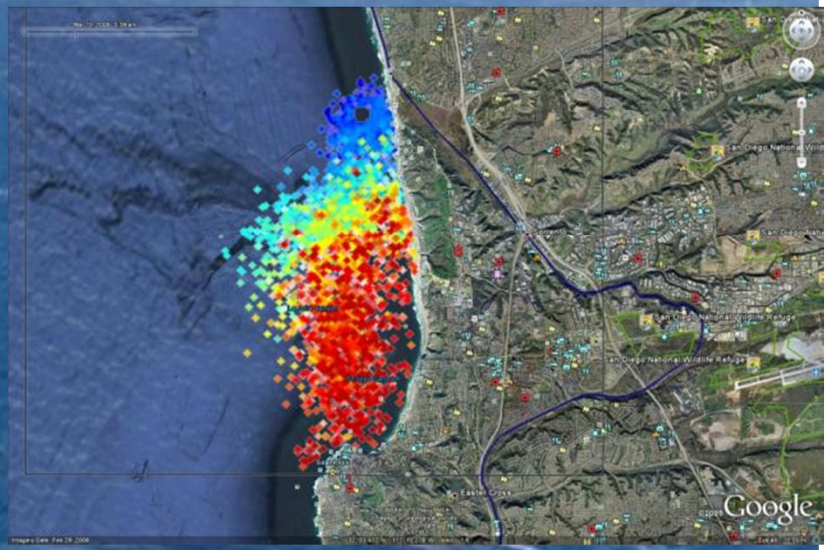
DOES PLUME WATER FROM LOS PENASQUITOS LAGOON REACH THE LJ ASBS

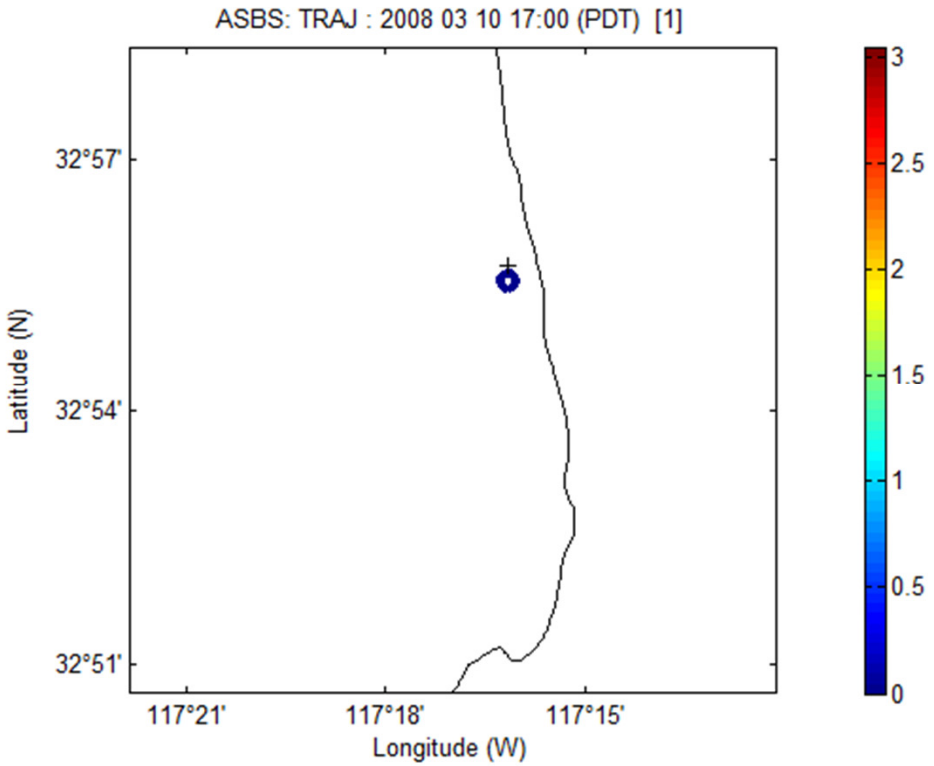
Photo: E.Terrill


Problem Statement:
Does plume water from Los Penasquitos Lagoon reach the La Jolla ASBS?
Los Penasquitos
8 km
ASBS
Del Mar
5
56
805

Case Study 4: Areas of Special Biological Significance

3 day lifetime used to replicate efficacy of FIB





Trajectories from Los Penasquitos River Inlet. 5-day discharge.

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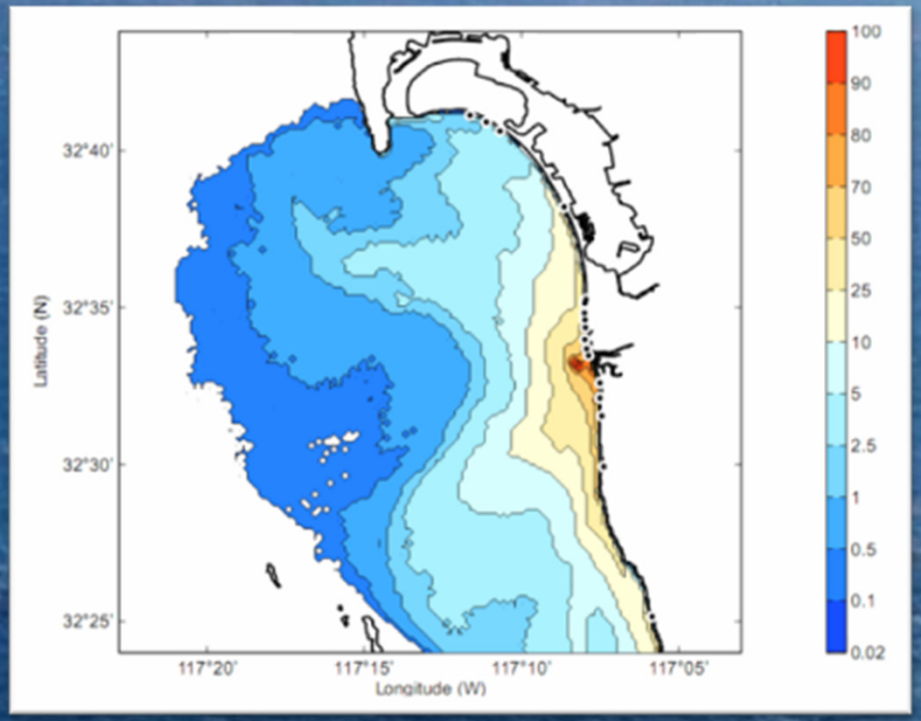
Sept. 24, 2012

Southern California Coastal Ocean Observing System

Case Study 4: Areas of Special Biological Significance

Probability Exposure Maps for Specific Areas



Sept. 24, 2012

SWRCB Water Quality Data Management

- CEDEN - California Environmental Data Exchange Network - *"is a central location to find and share information about California's water bodies, including streams, lakes, rivers, and the coastal ocean. .... CEDEN aggregates this data and makes it accessible to environmental managers and the public.*"

- SWAMP - California Surface Water Ambient Monitoring Program (SWAMP) - *" was created to fulfill the State Legislature's mandate for a unifying program that would coordinate all water quality monitoring conducted by the State and Regional Water Boards.*"

- CIWQS - California Integrated Water Quality System (CIWQS) - *" is a computer system used by the State and Regional Water Quality Control Boards to track information about places of environmental interest, manage permits and other orders, track inspections, and manage violations and enforcement activities. CIWQS also allows online submittal of information by Permittees within certain programs and makes data available to the public through reports."*

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Sept. 24, 2012

Southern California Coastal Ocean Observing System

SWAMP 2.5 Chemistry

- **Required**
- (White background) Fill in rows before you run the transformer - Most of this information will be provided in the Chain of Custody and/or Analysis Authorization form
- Fill in rows before you run the transformer
- Double check or fill in after you run the transformersformer

LabSampleID
StationCode
EventCode
ProtocolCode
LocationCode
SampleDate
CollectionTime
CollectionMethodCode
SampleTypeCode
Replicate
CollectionDepth
UnitCollectionDepth
ProjectCode
AgencyCode
CollectionComments
SampleID
PreparationPreservation
PreparationPreservationDate

DigestExtractMethod
DigestExtractDate
LabBatch
AnalysisDate
LabReplicate
MatrixName
MethodName
AnalyteName
FractionName
Unit
DilFactor
Result
ResultQualCode
MDL
RL
QACode
ExpectedValue
LabResultComments

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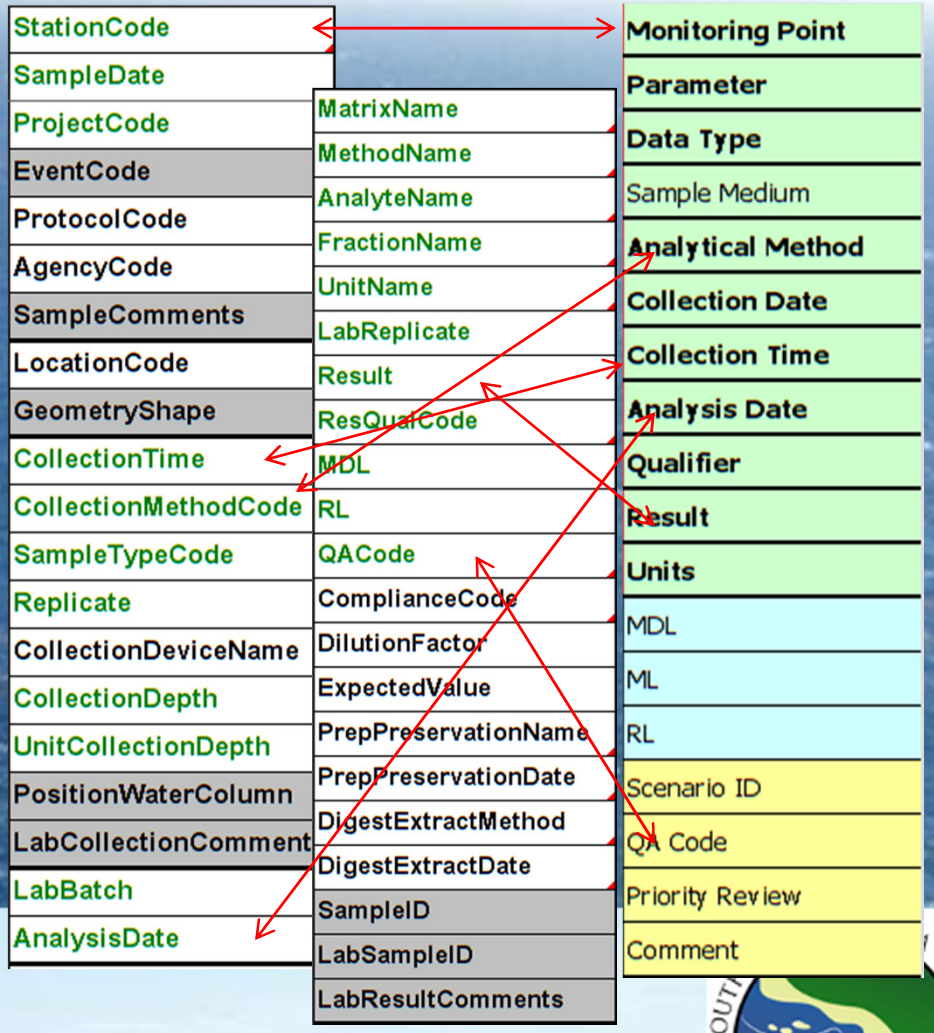
Sept. 24, 2012

SOUTHERN CALIFORNIA COASTAL OCEAN OBSERVING SYSTEM

CEDEN and CIWQS

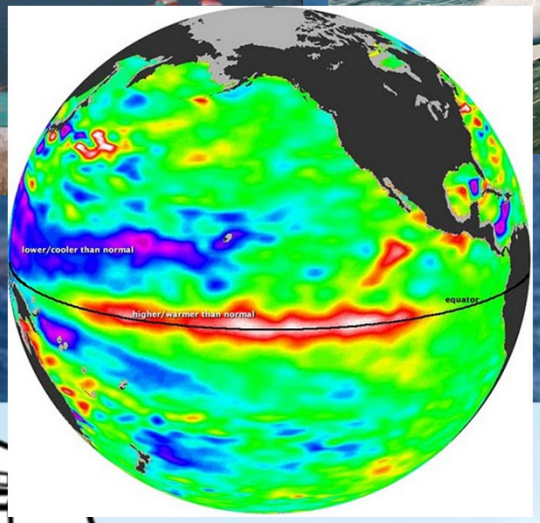
1. **Black bolded text indicates a Requested/Desired field**
2. Bolded Green text indicates a Minimum/Required field necessary for loading data into CEDEN.
3. Grey highlighted cells indicate an extra field used for additional information and completeness purposes.

How to streamline?



Sept. 24, 2012

Thank You!



Sept. 24, 2012